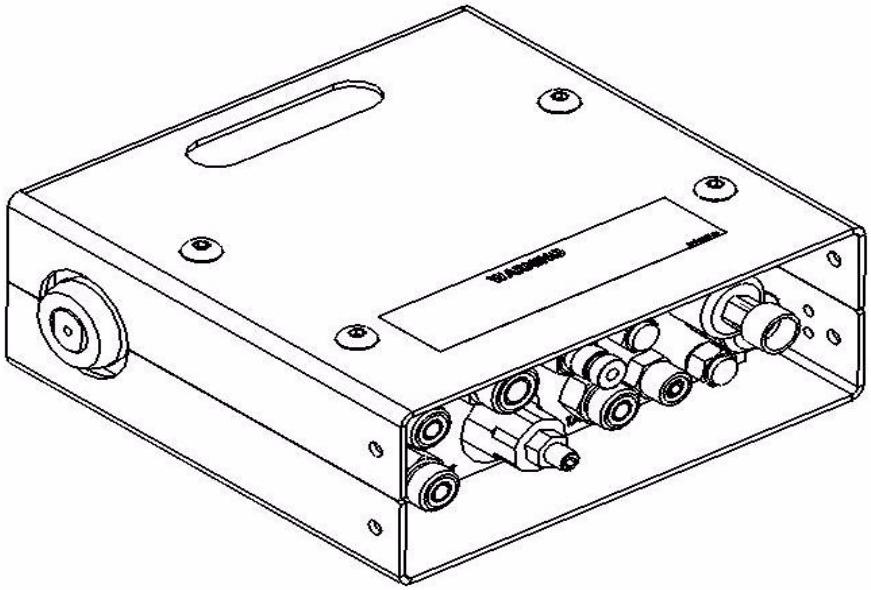
GPS AutoSteer System
Installation Manual



Closed Center Compact Valve
Custom Hardware Installation

Guidelines and Recommendations

THIS MANUAL IS FOR TRAINED AUTOSTEER DEALERS ONLY

PN: 602-0194-01-A

LEGAL DISCLAIMER

Note: Read and follow ALL instructions in this manual carefully before installing or operating the AutoSteer system.

Note: Take careful note of the safety information in the Safety Information section and throughout this manual.

The manufacturer disclaims any liability for damage or injury that results from failure to follow the instructions and warnings set forth herein.

Please take special note of the following warnings:

1. There is NO obstacle avoidance system included in the manufacturer’s product. Therefore, users must always have an operator on the equipment when the AutoSteer system is in use to look for any obstacles including people, animals, trees, ditches, buildings, etc.
2. During installation of the AutoSteer system and during the Calibration and Tuning processes the vehicle's wheels turn from side to side and the vehicle moves. Be sure that all people and obstacles are clear of the vehicle before installation, calibration and tuning, or use of the AutoSteer system.
3. Use of the AutoSteer system is NOT permitted while the vehicle is on public roads or in public areas. Ensure that the system is OFF before driving on roads or in public areas.

Special Requirements

Tools

This list consists of the tools required to complete the installation. The installer is assumed to have a complete set of common installation tools.

1/8" Allen wrench	3/8" open wrench	19mm open wrench
5/32" Allen wrench	1/2" open wrench	17mm socket and ratchet
3/16" Allen wrench	9/16" open wrench (2x)	18mm socket and ratchet
1/4" Allen wrench	11/16" open wrench	19mm socket and ratchet
10mm Allen wrench	3/4" open wrench	21mm socket and ratchet
#2 Phillips screwdriver	13/16" open wrench	Breaker bar for 18mm socket
1/2" ratchet wrench	7/8" open wrench	Torque wrench for 18mm socket
1/2" socket and ratchet	15/16" open wrench	Wire cutter small
9/16" socket and ratchet	1-1/16" open wrench	Cleaning rags
15/16" socket and ratchet	Hacksaw with steel cutting blade (for optional Wheel Angle Sensor installation)	5000 psi Pressure Gauge with a Short Hose and 1/8" Test Port Coupler that meets the SAE J1502 standard.
Oil catch pan	Cleaning brush	Tape measure (12ft minimum)
Cable puller pole	10 ft (3 meter) ladder	

Safety Information

Warning Alerts

The AutoSteer system installer and manufacturer disclaim any responsibility for damage or physical harm caused by failure to adhere to the following safety requirements:

- As the vehicle operator you are responsible for its safe operation.
- The AutoSteer system is *not* designed to replace the vehicle's operator.

Note: Verify all screws, bolts, nuts, hose connections and cable connections are tight after the AutoSteer system installation is complete.

⚠ WARNING

To avoid electrical shock hazards, remove the Roof Module from the vehicle before driving under low structures or low electrical power lines.

⚠ WARNING

To prevent injury from falling, ensure you are in a stable position on the vehicle when installing or removing the Roof Rail and Roof Module. If the vehicle does not provide a safe platform, use a ladder to safely access the vehicle roof while installing or removing the Roof Rail and Roof Module.

⚠ WARNING

To prevent accidental death or injury from being run over by the vehicle, never leave the vehicle's operator chair with the AutoSteer system engaged.

⚠ WARNING

High-Pressure Fluid Hazard

Read this manual before installation. Wear hand and eye protection while performing hydraulic system maintenance. Relieve hydraulic system pressure before servicing the hydraulic system.

⚠ WARNING

To understand the potential hazards associated with the operation of AutoSteer equipment read the provided documentation before installing the AutoSteer system on a vehicle.

⚠ WARNING

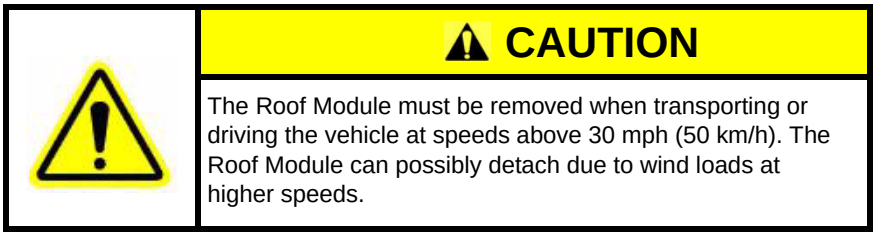
To prevent the accidental engagement of AutoSteer and loss of vehicle control while driving on roads, shut down the AutoSteer system (exit the program). Never drive on roads or in public areas with the AutoSteer system turned on.

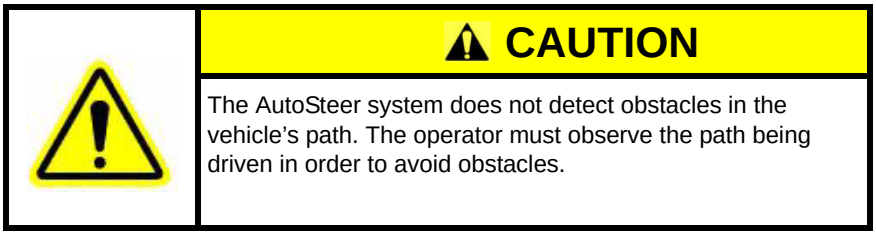
⚠ WARNING

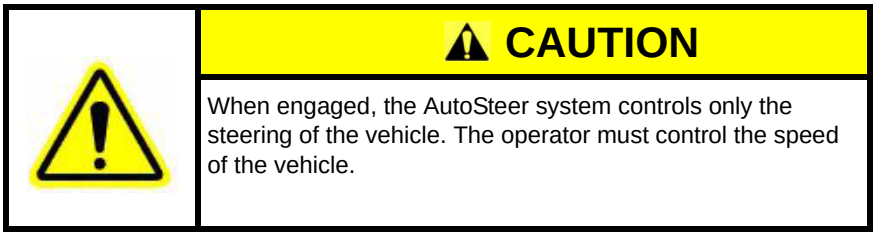
Do not stand close to the wheels and do not move the vehicle while you are adjusting the Relief Valve. Turn off the engine and engage the parking brake before standing under or next to the vehicle.

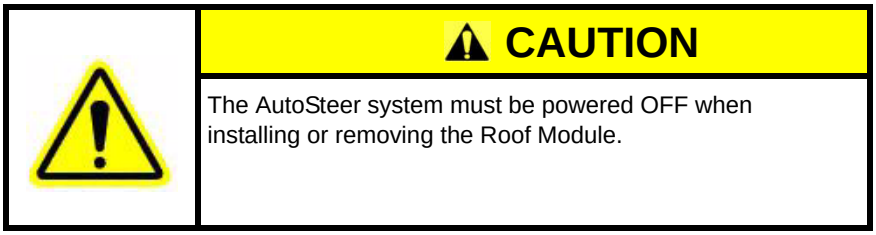
Caution Alerts

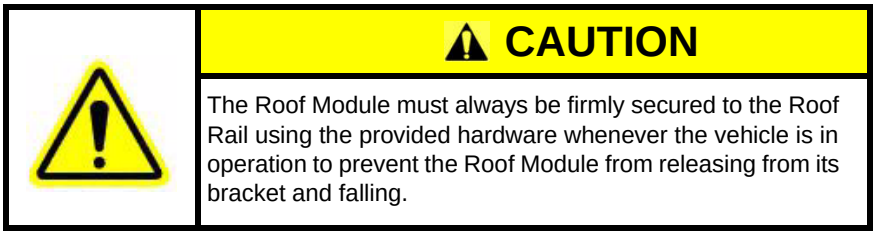
The AutoSteer system installer and manufacturer disclaim any responsibility for damage or physical harm caused by failure to adhere to the following safety requirements:


CAUTION
The Roof Module must be removed when transporting or driving the vehicle at speeds above 30 mph (50 km/h). The Roof Module can possibly detach due to wind loads at higher speeds.


CAUTION
The AutoSteer system does not detect obstacles in the vehicle's path. The operator must observe the path being driven in order to avoid obstacles.


CAUTION
When engaged, the AutoSteer system controls only the steering of the vehicle. The operator must control the speed of the vehicle.





CAUTION

The Roof Module must always be firmly secured to the Roof Rail using the provided hardware whenever the vehicle is in operation to prevent the Roof Module from releasing from its bracket and falling.

Vehicle Requirements

The vehicle must be equipped with a closed center load sense non-reactive steering system or a closed center load sense non-reactive steering system and a fully functional Power Beyond System. The Power Beyond system provides the following ports on the rear of the vehicle:

- Pressure
- Tank
- Load Sense

The vehicle steering and hydraulic systems must be in good working order before installing the AutoSteer system. Check for loose or worn parts. Before installing the AutoSteer system drive the vehicle and verify it steers straight and the wheels can be turned from lock to lock. Check the steering system hydraulic hoses and connections to ensure there are no oil leaks.

The vehicle electrical system and battery must be in good working order.

The vehicle should be fully cleaned before installing the AutoSteer system. A clean vehicle improves the overall installation and cable routing and also reduces the chance for oil contamination when the hydraulic connections are opened. It is important to clean the area around the steering unit (Orbitrol), under the cab, front axle and frame.

Important Information

Note: Verify all screws, bolts, nuts, hose connections and cable connections are tight after the AutoSteer system installation is complete.

Technical Support

Refer to your AutoSteer Owner's manual for technical support information.

Contact Information

Refer to your AutoSteer Owner's manual for contact information.

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Installation Overview

This **Installation Overview** chapter contains part numbers, kit overview diagrams, cabling diagrams and the installation procedures for custom Compact Valve Closed Center Installations.

- *Introduction*
  - *Installation Guidelines*
  - *Vehicle Requirements*
- *Supported Installation Types*
  - *Orbitrol Closed Center Installation*
  - *Orbitrol Closed Center with Power Beyond Connections*
- *AutoSteer Installation Kit Overview*
    - *Assemblies*
    - *AutoSteer Valve Kit Components*
    - *Bracket Kit Components*
- *Installation Procedure Outline*
- *Cable Diagram*

Introduction

This manual provides information for completing a custom AutoSteer installation on wheeled farm vehicles that are not supported by AutoSteer vehicle specific installation kits. A working AutoSteer installation requires brackets and hoses that correctly fit the vehicle. This manual provides guidelines, specifications and examples of typical AutoSteer installations for the purpose of helping AutoSteer dealers accomplish a working installation which is safe and performs satisfactorily.

This manual does not cover all possible types of vehicles or even nuances that exist between different brands and models of farm machinery so it is the installer’s responsibility to determine if the installation correctly fits the vehicle and performs in a safe manner.

Note: Do not attempt this installation if you have not received training for the AutoSteer product installation and if you have not completed at least ten (10) standard AutoSteer kit installations. Do not attempt this installation if you do not have complete information and familiarity with the vehicle's steering system and hydraulic system. The installer assumes all responsibility for using good judgment and good fabrication practices when performing this installation.

Installation Guidelines

1. Understand the type of steering system being used on the installation vehicle.
2. Refer to the vehicle steering system hydraulic schematic (often found in the shop manual) to determine the type of steering used.
3. Do not install the valve on steering systems not specifically covered in this manual.
4. Only install the valve on slow speed off-road agricultural vehicles.

Note: Do not install the valve on highway vehicles.

---

5. Install the AutoSteer valve in a position enabling easy access and service.
6. The installation requires the fabrication of at least six custom hoses. The hose lengths are determined by valve installation location. If possible, install the valve close to the vehicle connection points.
7. All hoses connecting to the AutoSteer valve must use O-Ring Face Seal (ORFS) type hose fittings.
8. All hoses connecting to the vehicle must have hose fittings matching the type of fittings used on the vehicle (ORFS, JIC, Metric etc.).
9. Use only high quality hydraulic hose rated for 3000psi or higher.
10. Only use hoses and fittings from the same manufacturer. Do not mix hoses and fittings from different manufacturers.
11. All hoses must be crimped according to manufacturer recommendations using the recommended crimping tool.
12. Clean hoses inside after assembly using a blast of compressed air to eliminate contamination.
13. Cover the hose ends to avoid contamination during the vehicle installation.
14. Confirm all hoses are connected to the correct points at both ends before starting the engine.
15. Confirm all hose fittings are tight before starting the engine.
16. Route hoses away from vehicle moving or hot parts. Secure all hoses in a safe and protected position.
17. Use an oil pan or bucket to collect oil when hose connections are opened. Clean all oil spills immediately.
18. Follow all safety recommendations and good shop practices outlined in this manual.

Vehicle Requirements

A vehicle must meet all the following requirements before being considered for an AutoSteer installation:

- The vehicle must be a slow speed off road farm vehicle that does not exceed 30mph at top speed.
- The vehicle must be a wheeled vehicle running on three or more rubber tires.
- The vehicle must have a hydrostatic steering system comprised of a closed center load sense steering Orbitrol, one or more steering cylinders, and a hydraulic pump.
- The vehicle steering system must be in good running order without excessive play or hydraulic leaks.
- The steering system must be non-reactive (non-centering).
- The vehicle must have a 12VDC power source available.
- The vehicle must have only one steered axle.
- The vehicle must have a cab or structure for antenna mounting purposes.

Do not install this AutoSteer kit on the following vehicles types:

- Highway vehicles or high speed vehicles such as cars, pickups or trucks.
- Vehicles with reactive steering (self centering).
- Vehicles with a secondary steered axle such as rear wheel auxiliary steering.
- Vehicles that run on tracks.
- Vehicles with sloppy steering systems or that are in poor mechanical condition.
- Vehicles with poor electrical systems.
- Vehicles with unconventional steering systems.

We recommend the following Steps before considering a new vehicle for an AutoSteer installation:

- Obtain a copy of the vehicle hydraulic diagram to understand how the steering system and steering pump work.

Note: The hydraulic diagram is usually available in the vehicle shop manual or may be purchased from the vehicle dealer.

- Determine if the steering system is Closed Center with Load Sense or Open Center.
- Inspect the vehicle and determine if the hydraulic setup matches the manufacturer's hydraulic diagram.
- Inspect the vehicle to confirm it provides attachment points for the AutoSteer Display, GPS Roof Module, Wheel Angle Sensor, AutoSteer Valve and hydraulic hoses.
- Drive the vehicle in a small circle at slow speed and let go of the steering wheel to determine if the steering is non-reactive.

Note: Non reactive steering maintains the steering wheel steady and the vehicle continues in a circular path. Reactive steering enables the wheels to slowly return to center position while the steering wheel turns slowly without driver input.

- The AutoSteer kit described in this manual must only be installed on vehicles with non-reactive steering systems.
- Drive the vehicle and check for steering system response and check for pulling to one side. The vehicle must steer straight and the steering must be firm and responsive.
- Ensure a 12V power source is available and plan ahead for alternative electrical power connection. Measure the voltage at the power source using a multimeter.

Supported Installation Types

This installation manual describes AutoSteer system installations which use the AutoSteer compact steering valve assembly for the following hydraulic installation types:

- *Orbitrol Closed Center Installation*
- *Orbitrol Closed Center with Power Beyond Connections*

Note: Do not attempt to install the valve on hydraulic systems this manual does not support.

Orbitrol Closed Center Installation

Correct Installation Types

- Vehicles with a closed center non-reacting Orbitrol with a Load Sense line.

Note: The closed center Orbitrol may get its oil supply from a variable displacement pump or a fixed displacement gear pump with a LS steering Priority Valve.

- Installations where the Orbitrol uses conventional Load Sense or Dynamic Load Sense.

Incorrect Installation Types

- Vehicles with reactive (self centering) steering system.
- Very large vehicles requiring a higher oil flow and a larger AutoSteer valve.
- Vehicles with an Open Center steering system.
- Pressure compensated steering systems without an Orbitrol Load Sense port.

Orbitrol Closed Center with Power Beyond Connections

Correct Installation Types:

- Vehicles with a closed center non reacting Orbitrol, a Load Sense line and an available Power Beyond system. The Power Beyond system must have Pressure, Tank and LS ports available.

Note: The closed center Orbitrol may get its oil supply from a variable displacement flow and pressure compensated pump or a fixed displacement gear pump with a Load Sense steering Priority Valve. This installation is preferred and can be easier to install when the vehicle has an available Power Beyond system.

Incorrect Installation Types:

- Vehicles with reactive (self centering) steering system.
- Very large vehicles requiring a higher oil flow and a larger AutoSteer valve.
- Vehicles with an Open Center steering system.
- Pressure compensated vehicles not having an Orbitrol LS port.
- Vehicles not having Power Beyond available.

Note: On some vehicles with Power Beyond systems you can use this installation at your own discretion if a simpler Orbitrol hookup is not possible.

AutoSteer Installation Kit Overview

Note: This manual applies to Closed Center installations only. If you are installing on an Open Center steering system contact your AutoSteer dealer to obtain the correct installation kit and instructions.

Vehicles with closed center steering supported in this manual use the same top-level Installation Kit PN: 188-0006-01. The AutoSteer Installation Kit includes the following sub-assemblies

Figure 1-1 AutoSteer Closed Center Installation Kit Components (PN: 188-0006-01)

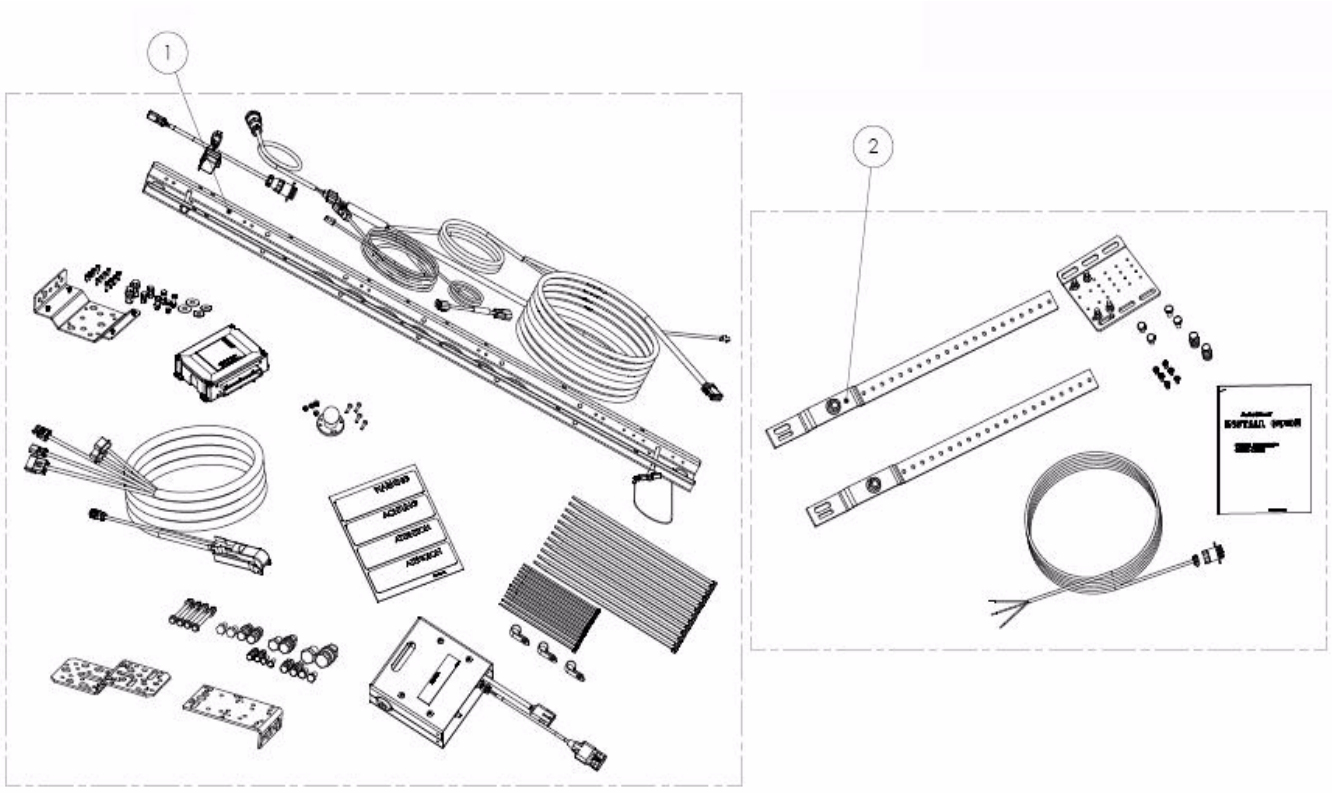


Table 1-1 AutoSteer Closed Center Kit Components (PN: 188-0006-01)

Item	Component	Part Number
1.	Compact Valve Kit	153-0001-01
2.	Custom Bracket Kit	152-0006-01

Assemblies

The AutoSteer vehicle installation kit contains the following components:

- *AutoSteer Valve Kit Components*
- *Bracket Kit Components*

AutoSteer Valve Kit Components

Figure 1-2 Installation Kit Sub-Assembly (PN: 153-0001-01)

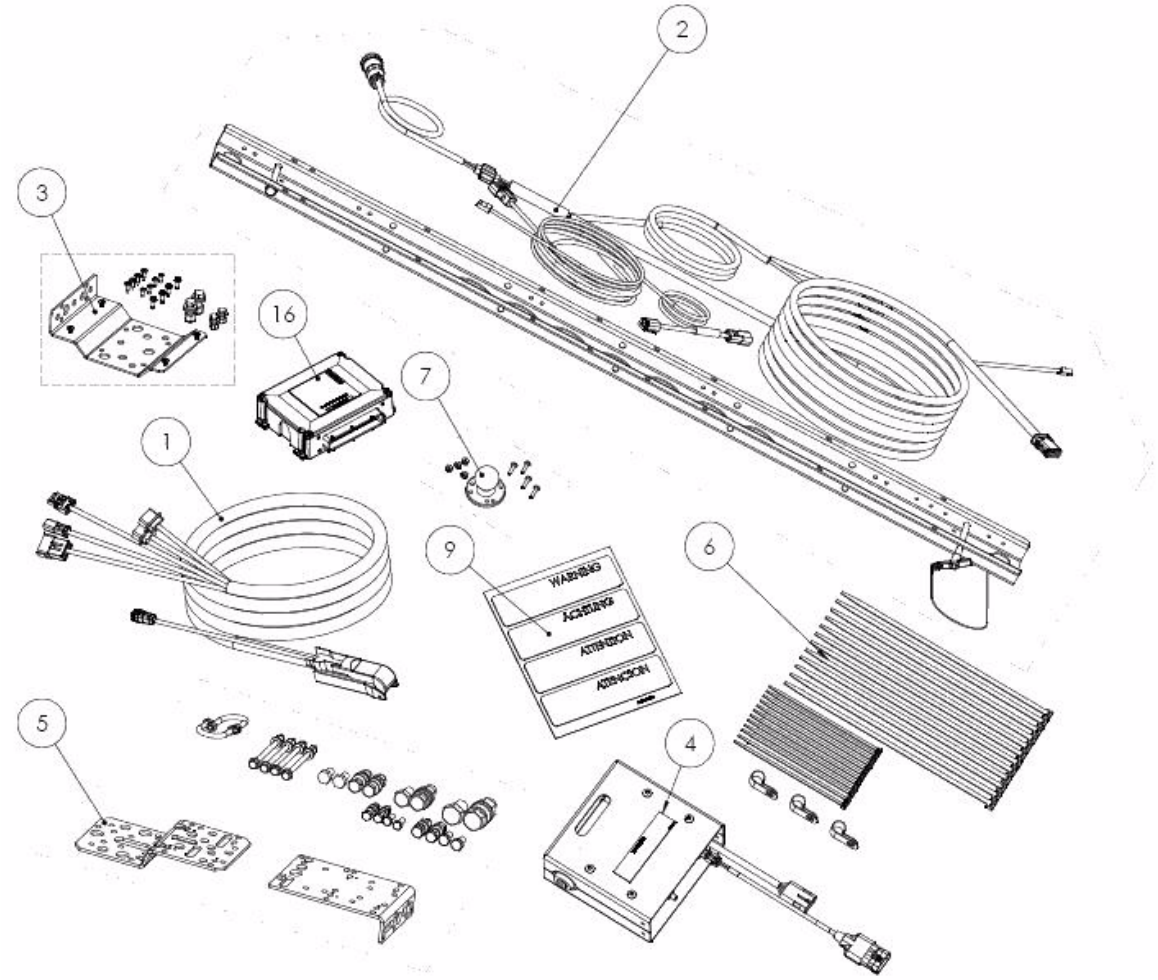


Table 1-2 Installation Kit Sub-Assembly Components (PN: 153-0001-01)

Item	Component	Part Number
1.	SA Module Harness	201-0371-02
2.	Common Kit	200-0497-02
3.	SA Module Bracket	200-0190-01

Item	Component	Part Number
4.	AutoSteer Valve Assembly	200-0457-01
5.	AutoSteer Valve Bracket Kit	200-0434-01
6.	Mounting Hardware	200-0076-01
7.	Display RAM Mount	200-0508-01
9.	Warning Labels	603-0074-01
16.	SA Module Assembly	200-0206-01

Bracket Kit Components

Figure 1-3 Bracket Kit Components (PN: 152-0006-01)

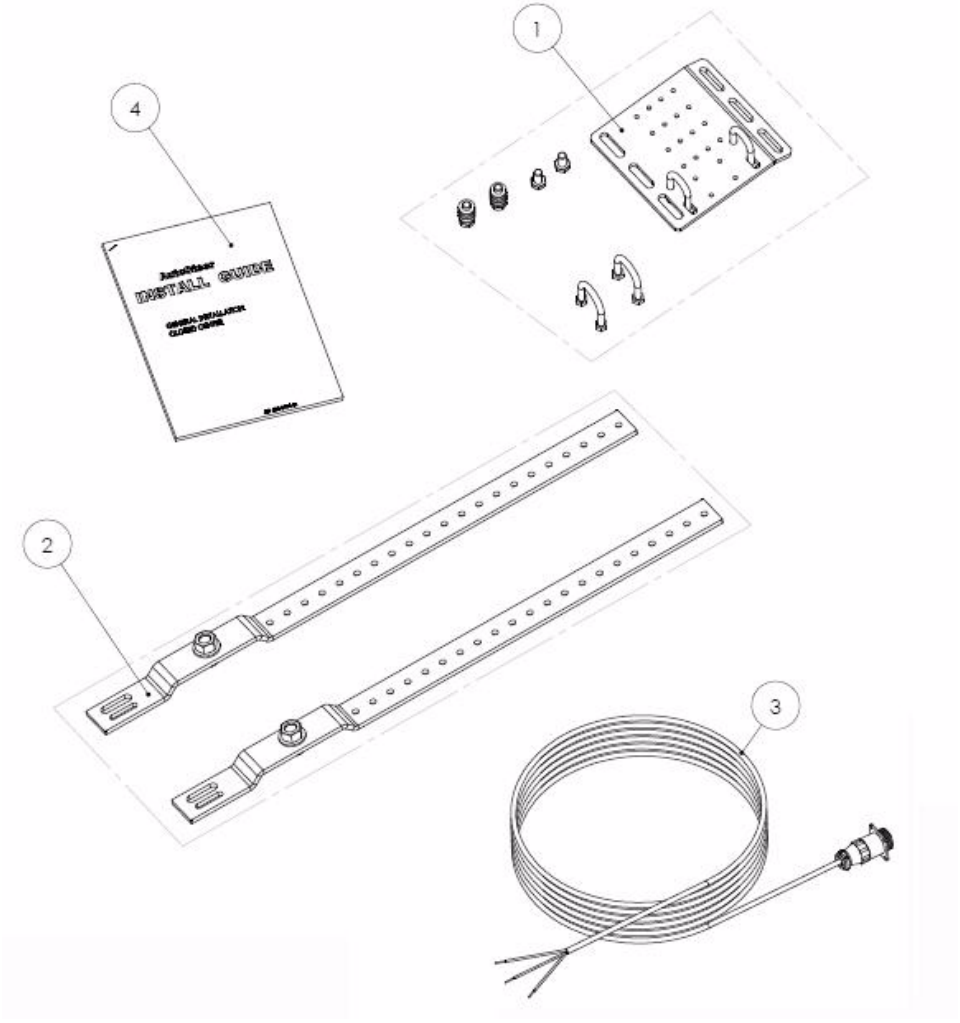


Table 1-3 Bracket Kit Components (PN: 152-0006-01)

Item	Component	Part Number
1.	Display Bracket	200-0469-02
2.	Roof Module Bracket	202-0132-01
3.	Battery Adapter Cable	201-0156-01
4.	Installation Guide	602-0194-01

Note: The bracket kit includes general purpose brackets and hardware you may modify to fit your vehicle. You may choose to fabricate special brackets for improved implementation.

Installation Procedure Outline

Follow the installation process described below. Use the step-by-step installation instructions provided in this manual to complete the tasks listed below.

1. Verify shipped components.

2. Install the Hydraulic Valve Assembly.

3. Install the Hydraulic Hoses.

4. Install the Wheel Angle Sensor.

5. Install the SA Module.

6. Install the Roof Module.

7. Install the Display.

8. Install the Main Cable Harness.

9. Ensure all connectors are properly coupled.

10. Power ON the AutoSteer system.

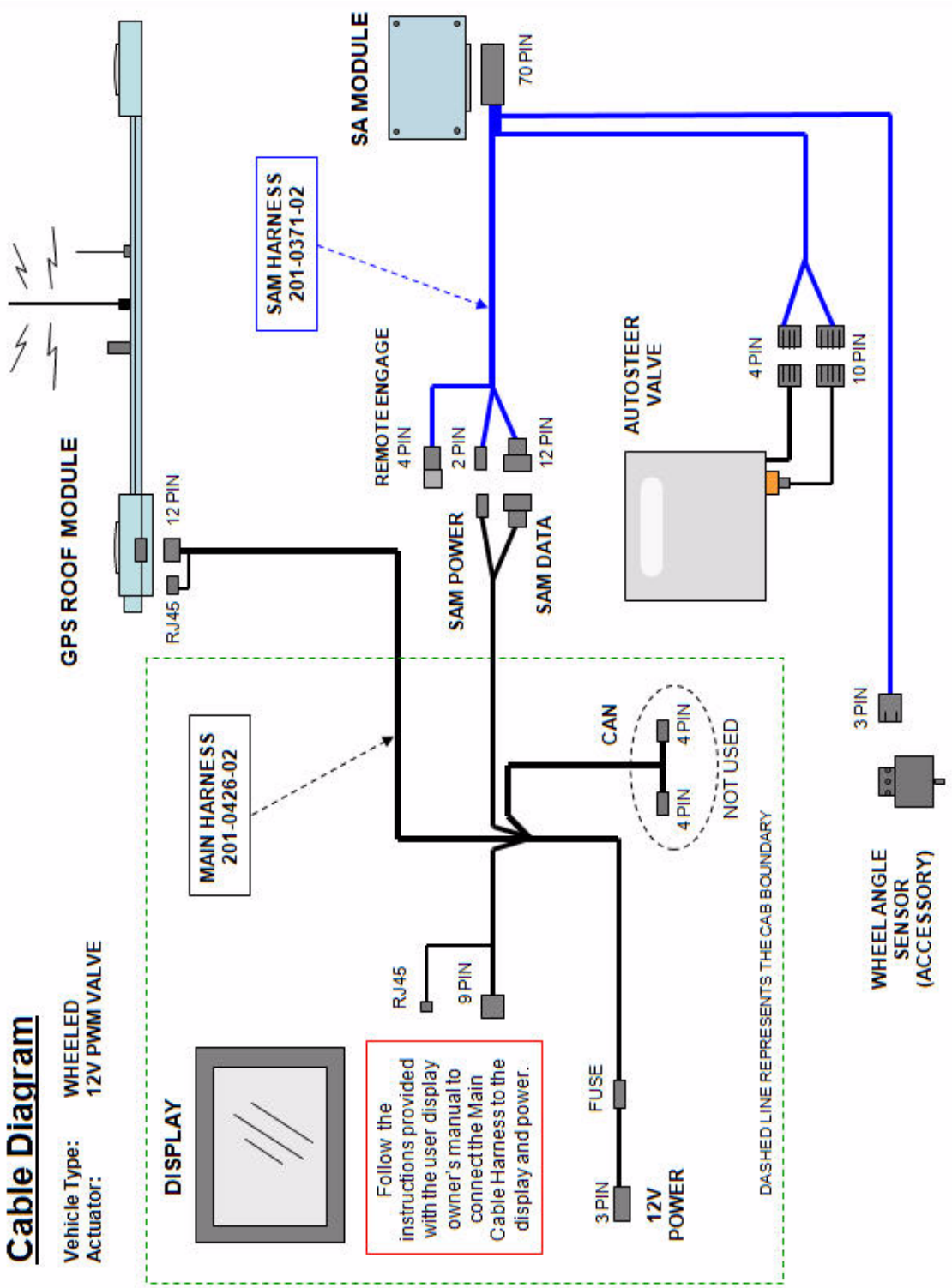
11. Calibrate the vehicle.

12. Tune the vehicle.

13. Verify installation and system operation.

Note: The *Cable Diagram* on page 9 of this chapter shows the AutoSteer system electrical connections.

Cable Diagram



Theory of Operation

This **Theory of Operation** chapter contains descriptions of AutoSteer component functional operations and their interactions when implemented in Compact Valve Closed Center installations.

- *AutoSteer Valve*
  - *Oil Supply*
  - *Right and left Steering Circuit*
  - *Manual Override Sensor*
  - *Load Sense*
  - *Plugs and Orifices*
- *Closed Center Valve Installations Overview*
  - *Closed Center Load Sense Orbitrol Installation*
  - *Closed Center Power Beyond Installation*
- *Wheel Angle Sensor*

AutoSteer Valve

Oil Supply

The AutoSteer valve receives high pressure oil from the vehicle pump at the PRESS port and returns low pressure oil back to tank through the TANK port. A Load Sense pilot signal is sent out through the LS OUT port for stroking up a pump or priority valve on machines that have variable flow pumps or a steering Priority Valve. A built-in Load Sense Relief Valve protects the pump from over-pressure by limiting the maximum LS pressure signal from the AutoSteer valve.

Right and left Steering Circuit

A 12 volt Proportional Valve directs oil to either the Right or Left valve port for steering the vehicle. To make a left turn, an electrical signal is sent to the Left coil on the Proportional Valve. The spool inside the Proportional Valve then enables oil flow between the PRESS port and the LEFT port while also allowing return oil flow from the RIGHT port to the TANK port.

To make a right turn, an electrical signal is sent to the Right coil on the Proportional Valve. The Proportional Valve then enables oil flow between the PRESS port and the RIGHT port while also enabling return flow from the LEFT port to the TANK port. Steering speed is controlled by the voltage or PWM (pulse width modulation) signal sent to the Proportional Valve coils. Higher voltages or higher PWM signals result in more spool movement and a higher oil flow through the Proportional Valve and a faster steering speed.

Pilot operated check valves are present at the Right and Left Steer ports, holding the vehicle’s steering cylinder in a fixed position between steering commands while also isolating the valve’s LS circuit from the manual steering pressures while manually steering.

Manual Override Sensor

A pressure transducer is installed on the valve TRANS port to provide a manual override (kick-out) electrical signal when the driver turns the steering wheel while in AutoSteer mode. The pressure transducer measures the pressure present on the LS OBITROL port. On closed center Load Sense systems, the pressure spike is measured on the Orbitrol's Load Sense line.

Load Sense

The Load Sense circuit is designed to handle most types of closed center Orbitrol Load Sense systems such as conventional Load Sense and Dynamic Load Sense. The LS circuit also handles Power Beyond installations.

The LS ORBITROL port is connected by a hose to the manual steering unit (Orbitrol) LS port under the steering wheel. The LS OUT port sends out an LS signal to stroke the pump and is connected by a hose to the LS port on the steering Priority Valve or LS port on the vehicle's Power Beyond system. The LS circuit enables LS oil flow across the valve in both directions as long as a plug is not installed in position 13B. A plug in position 13A can be replaced by an orifice when the vehicle's LS circuit requires a bleed-down to tank to de-stroke the pump when AutoSteer is not turning the wheels.

Plugs and Orifices

The valve is supplied with one extra blind plug and two extra orifices with a diameter of 0.022" and 0.031." These extra orifices enable several different configurations of the Load Sense circuit to handle various kinds of Load Sense installations commonly found on vehicles and farm machinery. Refer to the configuration tables in this manual to determine the correct orifice and plug configuration according to the type of steering system and hookup.

Closed Center Valve Installations Overview

Closed Center Load Sense Orbitrol Installation

The AutoSteer pressure and tank hoses are teed into the Orbitrol pressure and Return Lines and share the same oil supply that can come from either a variable displacement pump or a fixed displacement pump with a priority valve. The Orbitrol's LS hose is looped through the AutoSteer valve so that the Orbitrol and AutoSteer valve share the same LS circuit. The LS circuit inside the AutoSteer valve will handle oil flow in either direction and will therefore work with either static LS or dynamic LS systems.

An LS Relief Valve inside the AutoSteer valve limits the maximum LS pressure and therefore limits the maximum pump pressure. A pressure sensor connected to the LS hose that goes to the Orbitrol detects a pressure spike when the steering wheel is turned and kicks-out AutoSteer. The AutoSteer right and left steering hoses are teed into the machines steering lines and sends oil directly to the steering cylinders. The non reactive Orbitrol keeps the steering wheel stationary while AutoSteering.

Closed Center Power Beyond Installation

The AutoSteer pressure, tank and LS hoses are connected to the vehicle Power Beyond system which is independent of the vehicle steering system. An LS Relief Valve inside the AutoSteer valve limits the maximum LS pressure and limits the maximum pump pressure for AutoSteer mode. A second LS hose is teed into the Orbitrol's LS hose for detecting a pressure spike when the driver turns the steering wheel. The transducer signal is used to kick-out AutoSteer when the driver turns the steering wheel. The AutoSteer right and left steering hoses are teed into the machines steering lines and sends oil directly to the steering cylinders. The non reactive Orbitrol keeps the steering wheel stationary while AutoSteering.

Wheel Angle Sensor

The AutoSteer Wheel Angle Sensor measures the position of the vehicle steered wheels and provides wheel position feedback to the AutoSteer controller. The sensor is a 3-wire potentiometer with an electrical rotation angle of 120 degrees and a mechanical rotation angle of 180 degrees. The Wheel Angle Sensor should be installed and adjusted to rotate approximately 90 degrees when the wheels turn from lock to lock. The amount of rotation on the Wheel Angle Sensor is determined by the length and geometry of the threaded linkage rods.

Table 2-1 Potentiometer Resistance and Counts (typical values)

Rotation (degrees)	Resistance (Ohms)	Encoder Counts
0	790	256
20	1580	11088
40	2370	21936
60	3150	32768
80	3940	43600
100	4730	54448
120	5520	65280

SA Module

The AutoSteer SA Module is an electronic enclosure that is permanently mounted to the vehicle and connects the AutoSteer controller to all AutoSteer sensors and actuators. The SA Module receives sensor inputs from the Wheel Angle Sensor and the AutoSteer valve pressure transducer and outputs electrical signals to the AutoSteer valve to steer the vehicle. The SA Module communicates with the AutoSteer display and the AutoSteer Roof Module through a proprietary CAN bus.

Steering Valve Installation

This **Steering Valve Installation** chapter information is provided in the following sections:

- *Steering Valve Overview*
  - *Specifications*
  - *Valve Hose Adapter Connections*
  - *Valve Covers*
  - *Mounting Hole Patterns*
- *Steering Valve Bracket Installation*
  - *Valve Installation Guidelines*
  - *Bracket Mounting Examples*
  - *Example Bracket Installation Procedure*
- *Steering Valve Installation Procedure Overview*
- *Valve Type Installation Procedures*
  - *Closed Center Load Sense Orbitrol Installation*
  - *Closed Center Load Sense Power Beyond Installation*
- *Pressure Transducer*
- *Adjusting the AutoSteer Relief Valve*
- *AutoSteer Valve Installation Checklist*

Steering Valve Overview

The steering valve installation requires custom hoses to fit each type of vehicle. Use only high quality hydraulic hoses rated for 3000 psi or more. Do not mix hose fittings and hoses of different brands. Assemble hoses and crimp fittings following the hose manufacturer's recommendations. Use only steel hose adapters rated for 3000 psi or more. Use hose fittings that match the type of fittings found on the vehicle.

Specifications

Table 3-1 Steering Valve Specifications

Function	Data
Description	Steering Valve
Part Number	200-0457-01
Application	Wheeled vehicles with 12 volt electrical system requiring steering oil flow up to 5.8 GPM.
Manifold Id	630AA00108A

Function	Data
Rated Oil Flow	5.8 GPM
Coil Voltage	12 Vdc
Weight	15 lbs (6.8 kg)

Valve Hose Adapter Connections

Figure 3-1 Valve Hose Adapter Connections

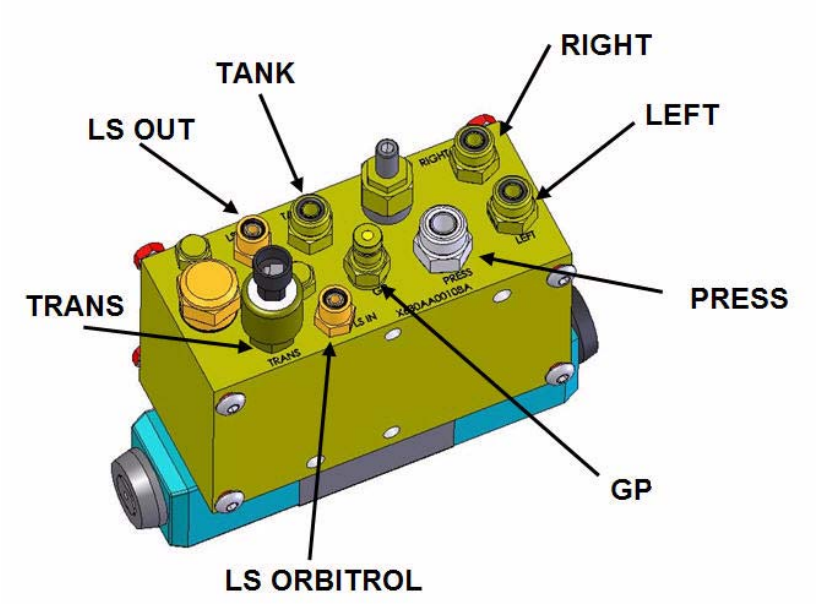
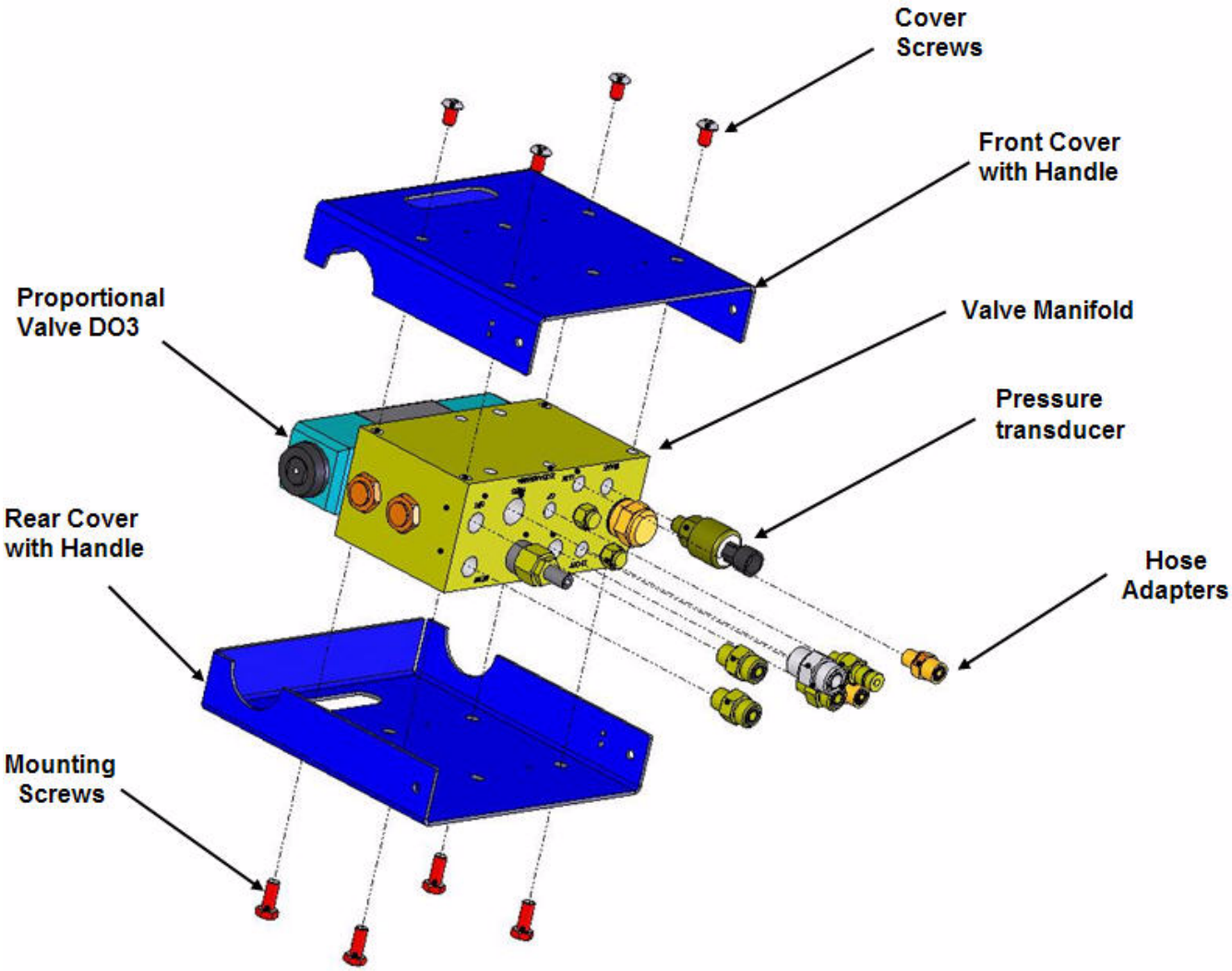


Table 3-2 Valve Connection Functions and Fitting Sizes

Hose Adapter	Fitting Type/Size
PRESS = PUMP PRESSURE (Power Beyond)	-8 ORFS
TANK = TANK / RETURN (Power Beyond)	-6 ORFS
LS ORBITROL = LS FROM ORBITROL	-4 ORFS
LS OUT = LS (Power Beyond)	-4 ORFS
LEFT = LEFT STEERING CYLINDER	-6 ORFS
RIGHT = RIGHT STEERING CYLINDER	-6 ORFS
GP = DIAGNOSTICS PORT	1/8”
TRANS = PRESSURE TRANSDUCER	-4 SAE ORB.

Valve Covers

Figure 3-2 Steering Valve Covers



Note: The steering valve rear cover may remain installed on the valve during the installation. The front cover must be removed during the installation to enable the valve configuration procedure and the hydraulic hose connections. The front cover can be identified by the Warning label.

Mounting Hole Patterns

Note: The valve may be secured using four screws threaded into the valve back side or two longer screws using the two through holes.

Figure 3-3 Steering Valve Four Screw Mounting Pattern

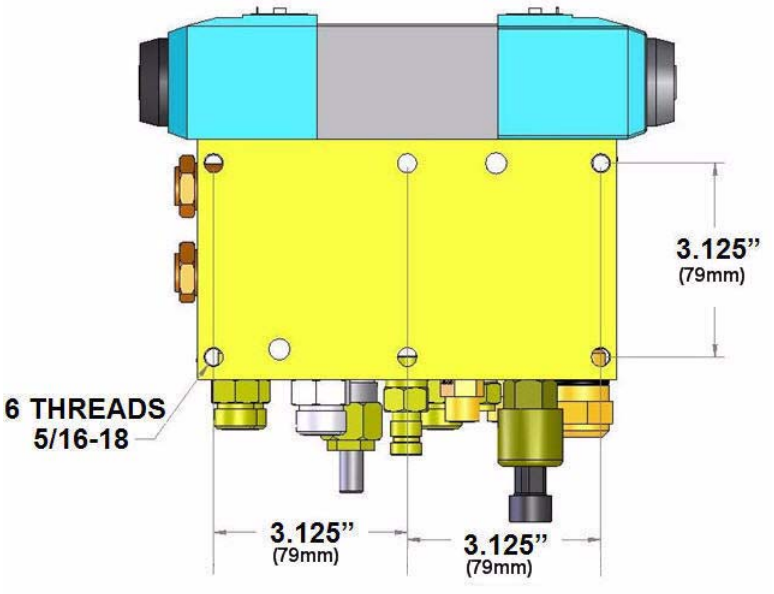
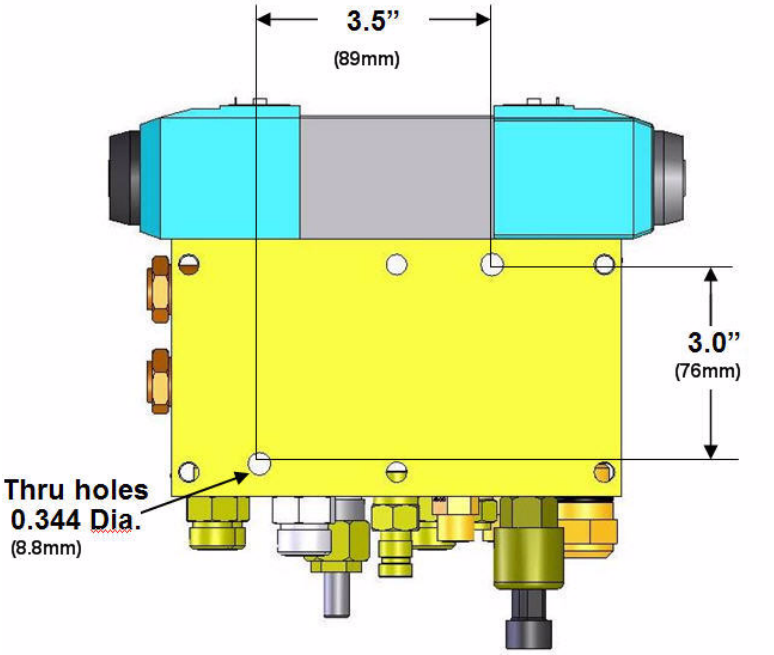


Figure 3-4 Steering Valve Two Through Body Screw Mounting Pattern



Orifice Location and Configuration

The valve has two internal plugs and orifices that must be configured to function with different types of Load Sense systems before the valve is installed on the vehicle. *Figure 3-5* and *Figure 3-6* show the location and access methods for the various steering valve ports and offices. *Table 3-3* shows the plug and orifice configuration for the supported types of hydraulic installation.

Figure 3-5 Orifice Location and Access

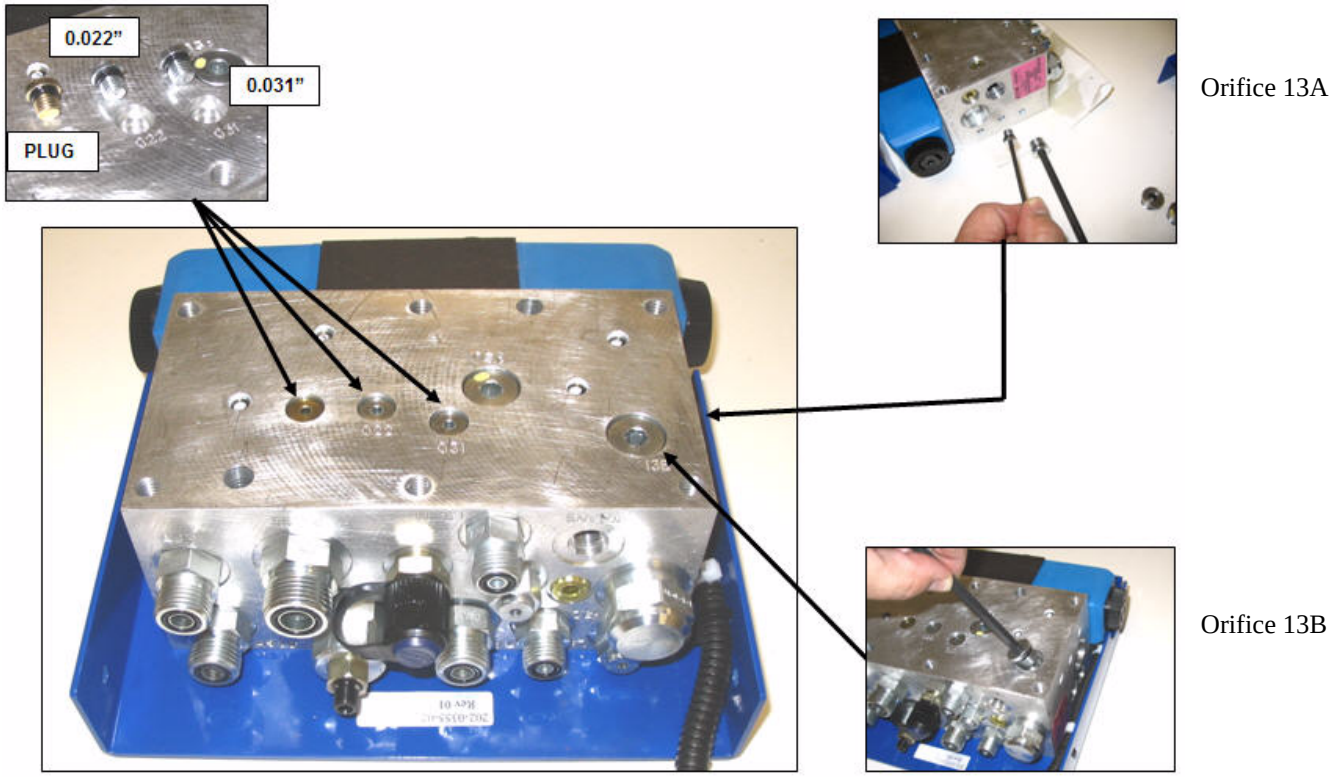


Figure 3-6 Orifice Configuration

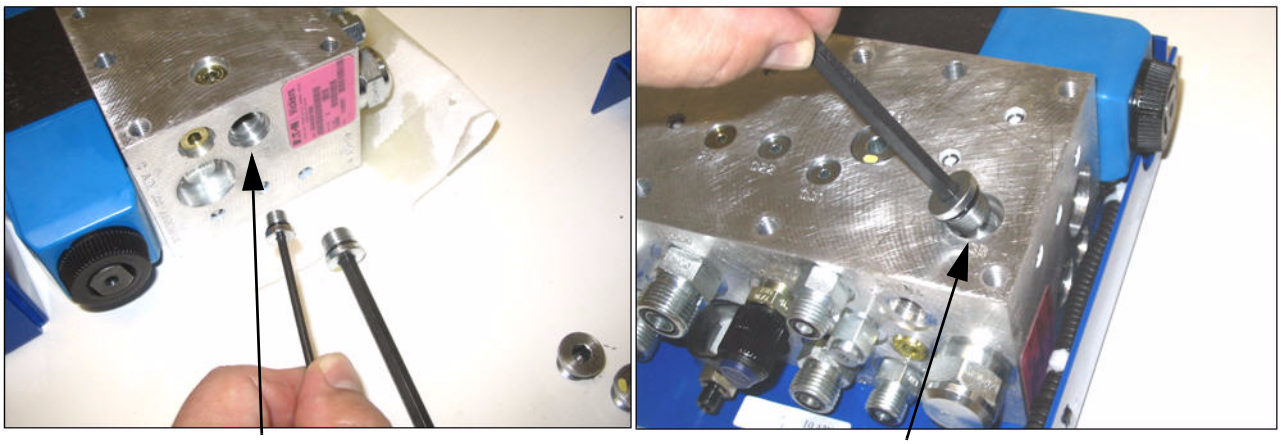


Table 3-3 Plug and Orifice Configurations

Hydraulic Installation Type	13A	13B
Factory Default Configuration (valve as-delivered)	Plug	Open
Closed Center Orbitrol hookup – Conventional Load Sense	Plug	Open
Closed Center Orbitrol hookup – Dynamic Load Sense	Plug	Open
Closed Center Orbitrol with Power Beyond	0.022” Orifice	Plug

Plug and Orifice Functions

- **13A** = An orifice installed here will bleed LS pressure from the LS OUT port to tank/return to de-stroke the pump.
- **13B** = A plug installed in this location isolates the LS ORBITROL port from the LS OUT port.

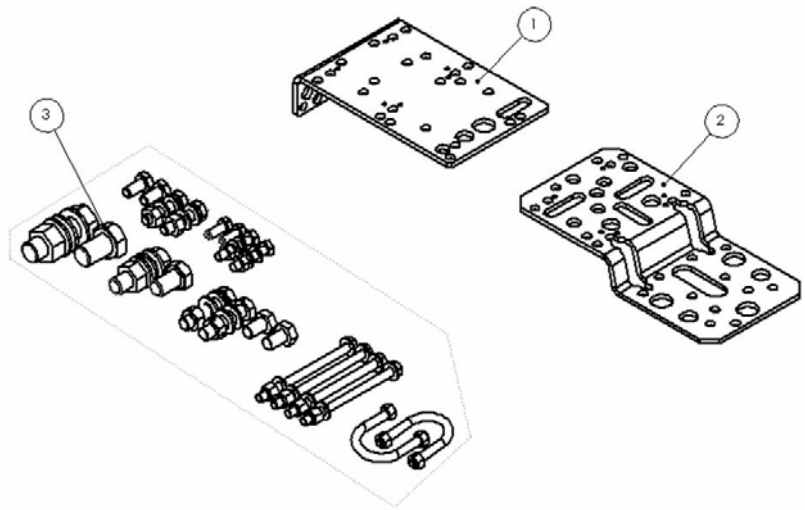
Note: This plug must never be installed for Closed Center LS Orbitrol applications because it blocks the flow of LS oil across the valve.

- **13C** = This plug isolates the internal LS circuit from tank and must always be installed for all supported applications.

Steering Valve Bracket Installation

The AutoSteer kit includes two universal valve brackets and metric hardware to fit most vehicles using existing attachment points. The brackets provide mounting holes and slot features to accommodate a variety of vehicle bolt spacings. See *Figure 3-7*.

Figure 3-7 Steering Valve Bracket Kit (PN: 200-0434-01)



Valve Installation Guidelines

1. Install the valve in a position that is protected from tall crops and debris.
2. Install the valve in a position enabling good hose routing and short hose lengths to the vehicle connection points.
3. Install the valve in a position which does not interfere with normal vehicle operation and moving parts such as covers, removable shields, wheels, lift arms and implements.
4. Install the valve in a position which is easy to access for service and hose connections. Do not install the valve in a position that is difficult to reach.
5. Install the valve on a vehicle structure providing sufficient strength to secure the valve weight plus the mounting bracket and hoses.
6. Secure the valve to the vehicle using existing bolts, threaded holes or through holes. The bracket kit includes a variety of short and long metric bolts and nuts in sizes M8, M10, M12, M16 and M20.

Bracket Mounting Examples

There are four basic methods for installing the steering valve brackets. *Figure 3-8* through *Figure 3-11* show various installation methods using the “L” and “S” brackets.

Figure 3-8 “L” Bracket Installation Example‘

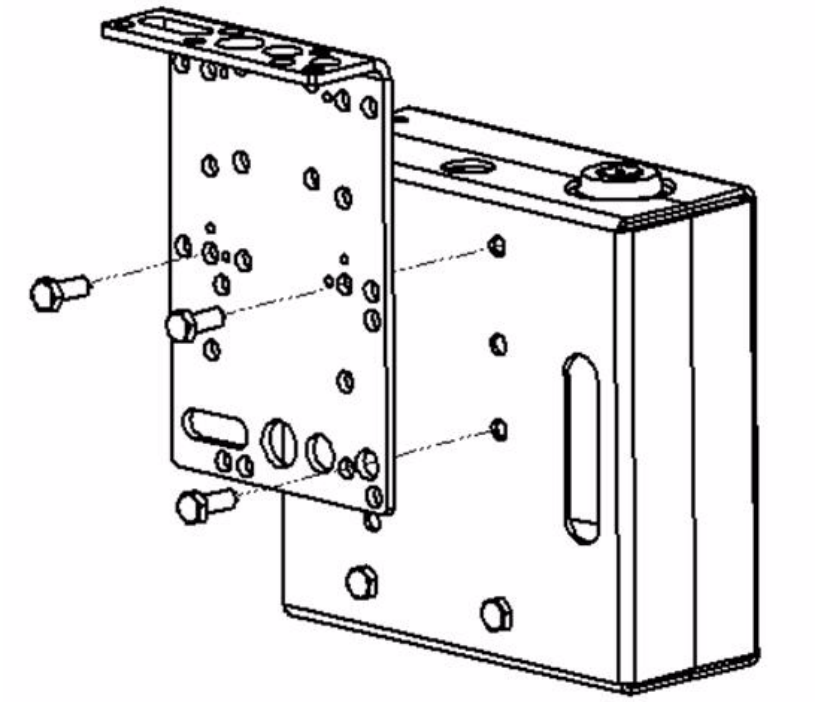
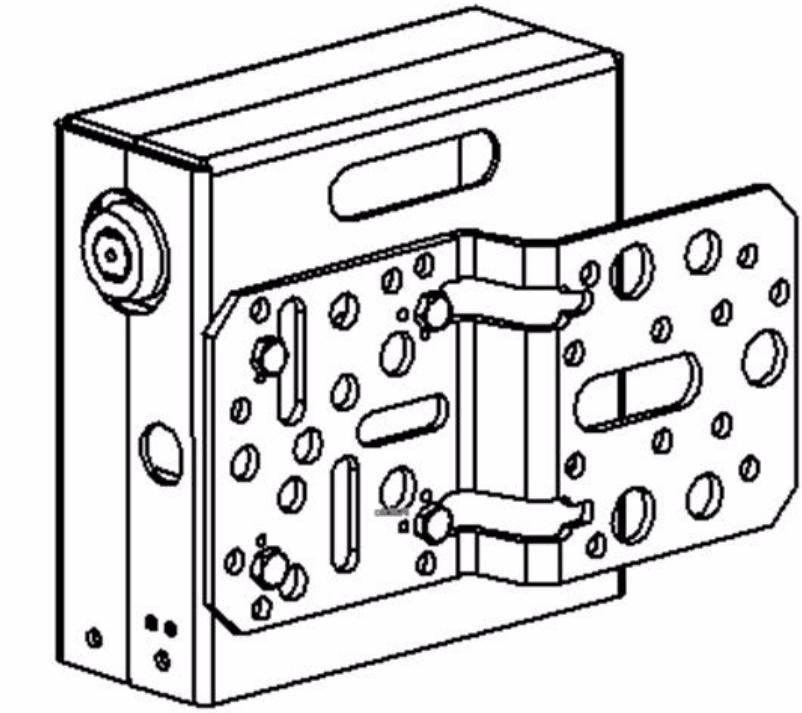
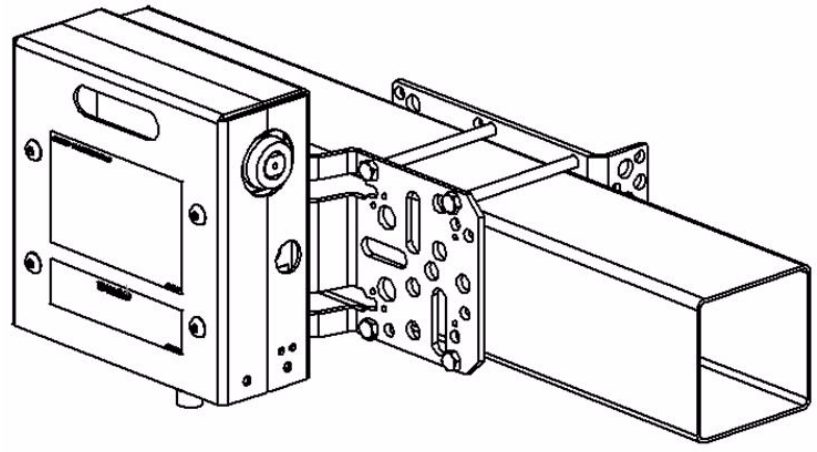


Figure 3-9 “S” Bracket Installation Example



Note: Use the two valve brackets plus the four long screws and locknuts to mount the valve to steel frames up to 4” x4” (100 x 100mm). See *Figure 3-10*.

Figure 3-10 Bracket Installation on Square Frame



Note: Use the “S” bracket and a pair of U-Bolts with locknuts to mount the valve on steel pipes up to 1.5” (38mm) diameter. See *Figure 3-11*.

Figure 3-11 Steel Pipe Bracket Installation

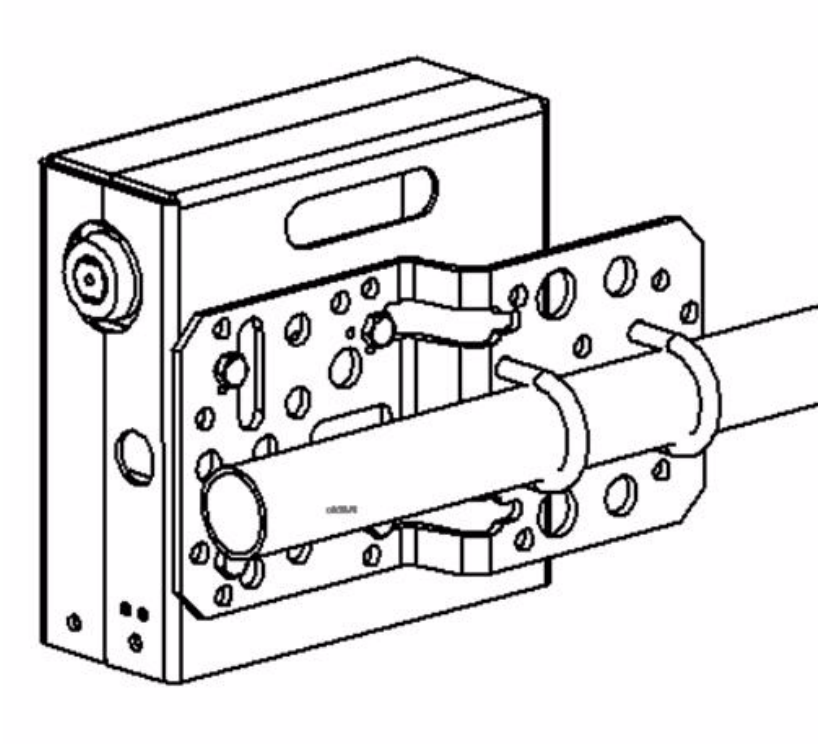
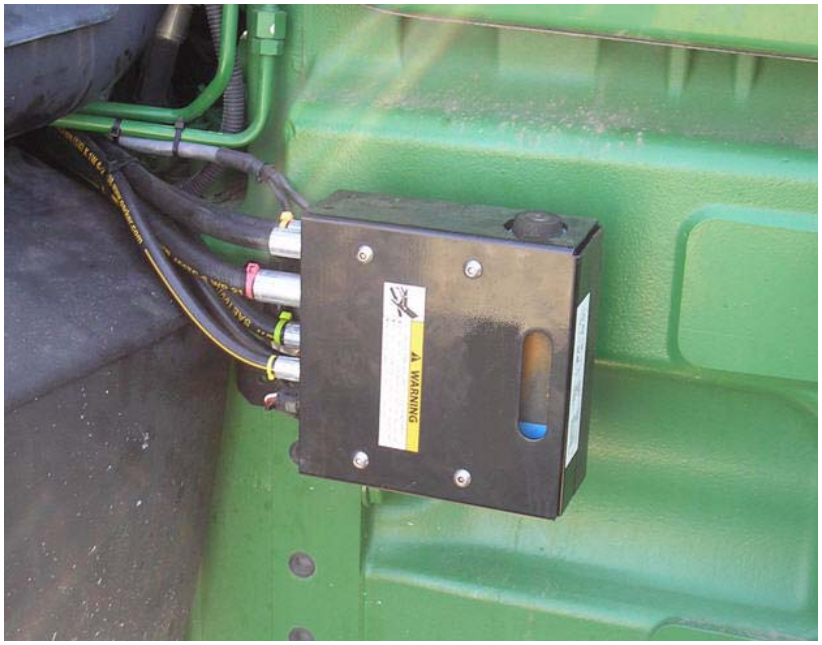


Figure 3-12 “L” Bracket Completed Installation Example

Figure 3-13 “S” Bracket Completed Installation Example



Example Bracket Installation Procedure

Mount the bracket to the vehicle using the provided hardware. See *Figure 3-14*.

Note: The metric bolts provided in your kit fit many vehicle models.

Figure 3-14 Mounting the “S” Bracket

Slide the valve onto the bracket. See *Figure 3-15*.

Note: You can leave two mounting screws already threaded into the valve and they will slide into the “U” slots on the bracket.

Figure 3-15 Slide Steering Valve On Bracket

Insert the two remaining hex screws to secure the valve to the bracket.

Tighten the four hex screws using a ratchet wrench.

Loosen the four Allen screws and remove the valve front cover to proceed with the hose installation. See *Figure 3-16*.

Figure 3-16 Removing Steering Valve Front Cover

Steering Valve Installation Procedure Overview

1. Configure the AutoSteer valve internal plug or orifice for your installation, as necessary.
2. Install the AutoSteer valve bracket and valve.
3. Connect the hoses between the valve and the vehicle.
4. Check for oil leaks.
5. Adjust the AutoSteer pressure Relief Valve.
6. Perform a functional test to confirm correct valve operation.

⚠ WARNING

High-Pressure Fluid Hazard

Read this manual before installation. Wear hand and eye protection while performing hydraulic system maintenance. Relieve hydraulic system pressure before servicing the hydraulic system.

Valve Type Installation Procedures

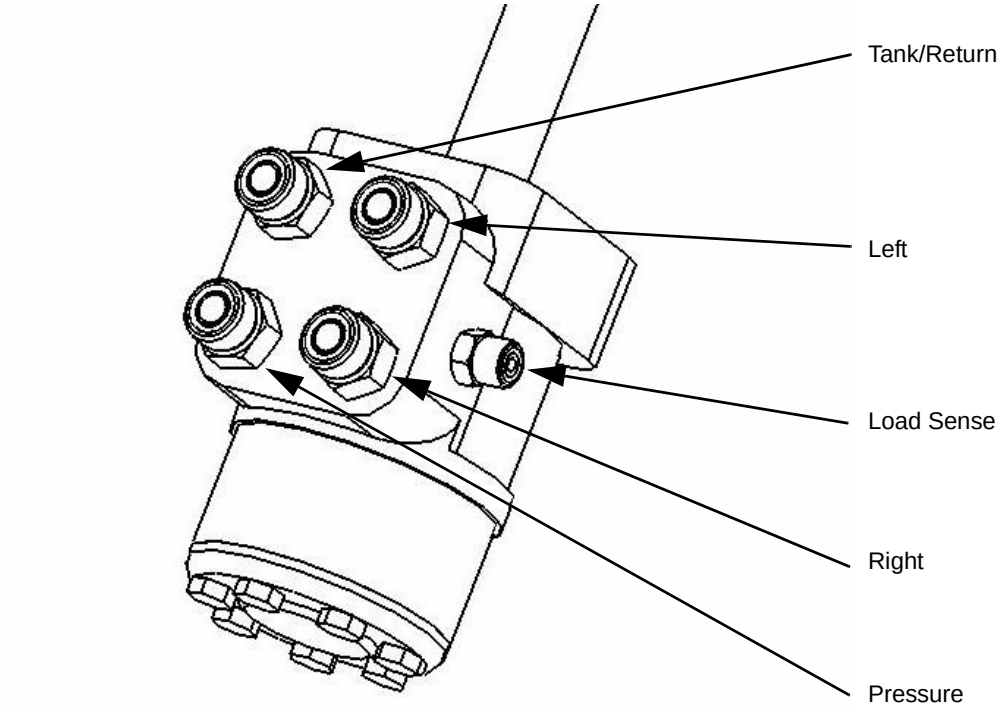
There are two AutoSteer compact valve installation types as shown in the following sections:

- *Closed Center Load Sense Orbitrol Installation*
- *Closed Center Load Sense Power Beyond Installation*

Closed Center Load Sense Orbitrol Installation

Use this valve installation when the vehicle has a closed center non-reacting Orbitrol with a Load Sense line. The closed center Orbitrol may get its oil supply from a variable displacement pump or a fixed displacement gear pump with a LS steering priority valve. The Orbitrol may use conventional static LS or Dynamic LS.

Figure 3-17 Typical Orbitrol Ports



The AutoSteer Pressure and Tank/Return hoses are teed into the Orbitrol pressure and Return Lines and share the same oil supply which can come from either a variable displacement pump or a fixed displacement pump with a priority valve. The Orbitrol's LS hose is looped through the AutoSteer valve so the Orbitrol and AutoSteer valve share the same LS circuit. The LS circuit inside the AutoSteer valve controls oil flow in either direction and works with either static LS or dynamic LS systems. An LS Relief Valve inside the AutoSteer valve limits the maximum LS pressure and therefore limits the maximum pump pressure. A pressure transducer connected to the LS hose connected to the Orbitrol detects a pressure spike when the steering wheel is turned and kicks-out AutoSteer. The AutoSteer Right and Left steering hoses are teed into the vehicle steering lines and send oil directly to the steering cylinders. The non-reactive Orbitrol keeps the steering wheel stationary while AutoSteering.

Note: Do not use this installation with the following vehicle types:

- Vehicles with reactive (self centering) steering system.
- Very large vehicles requiring a higher oil flow and a larger AutoSteer valve.
- Vehicles with an Open Center steering system.
- Pressure compensated steering systems without an Orbitrol Load Sense hose.

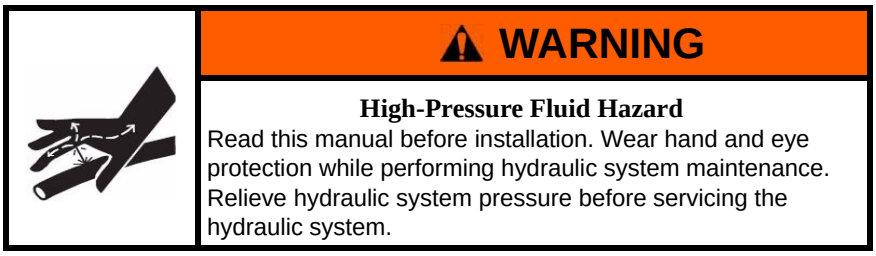
Valve Configuration

The AutoSteer valve has two internal plugs and orifices that must be configured to adjust the valve LS circuit for different types of installations. For this installation you may use the factory default configuration and no changes are necessary. *Table 3-4* provides the recommended plug configuration for reference and troubleshooting purposes only.

Table 3-4 AutoSteer Valve Plug and Orifice Configuration

Type of Installation	13A	13B
Factory Default Configuration (valve as-delivered)	PLUG	OPEN
Closed Center Orbitrol – Conventional Load Sense	PLUG	OPEN
Closed Center Orbitrol – Dynamic Load Sense	PLUG	OPEN

Installation Instructions



⚠ WARNING

High-Pressure Fluid Hazard

Read this manual before installation. Wear hand and eye protection while performing hydraulic system maintenance. Relieve hydraulic system pressure before servicing the hydraulic system.

1. Refer to *Figure 3-19* for a detailed hose connection diagram and follow the instructions below.
2. Disconnect the Pressure hose from the Orbitrol and install a Tee adapter.
3. Reconnect the Pressure hose to the Tee.
4. Connect a hose from the AutoSteer valve **Press** port to the Tee adapter installed on the Orbitrol Pressure port. This hose will provide oil pressure to the AutoSteer valve.

Note: *Figure 3-18* shows typical Orbitrol hose connections.

---

5. Disconnect the Orbitrol Tank/Return hose and install a Tee adapter. Reconnect the Tank/Return hose to the Tee.
6. Connect a hose from the Tank/Return port on the AutoSteer steering valve to the Tee adapter installed on the Orbitrol Tank port. This hose will connect the AutoSteer valve to Tank/Return.
7. Disconnect the LS hose from the Orbitrol and connect it to the LS Out port on the AutoSteer valve. Use an extender hose as necessary to reach the AutoSteer valve.
8. Connect a hose between the **LS Orbitrol** port on the AutoSteer steering valve and the LS port on the Orbitrol. This hose will re-establish the LS connection between the Orbitrol and the Priority Valve, passing through the AutoSteer valve.
9. Connect a hose between the **Right** port on the AutoSteer valve and the right steering hose on the Orbitrol. You may install the Tee adapter anywhere along the right steering line in a convenient location.
10. Connect a hose between the **Left** port on the steering valve and the left steering hose on the Orbitrol. You may install the Tee adapter anywhere along the left steering line in a convenient location.
11. Check each hose connection individually at both ends and confirm it matches the hose diagram in *Figure 3-19*.

Note: On vehicles with fixed displacement gear pumps, incorrect hose connections can cause immediate pump damage when the engine is started.

---

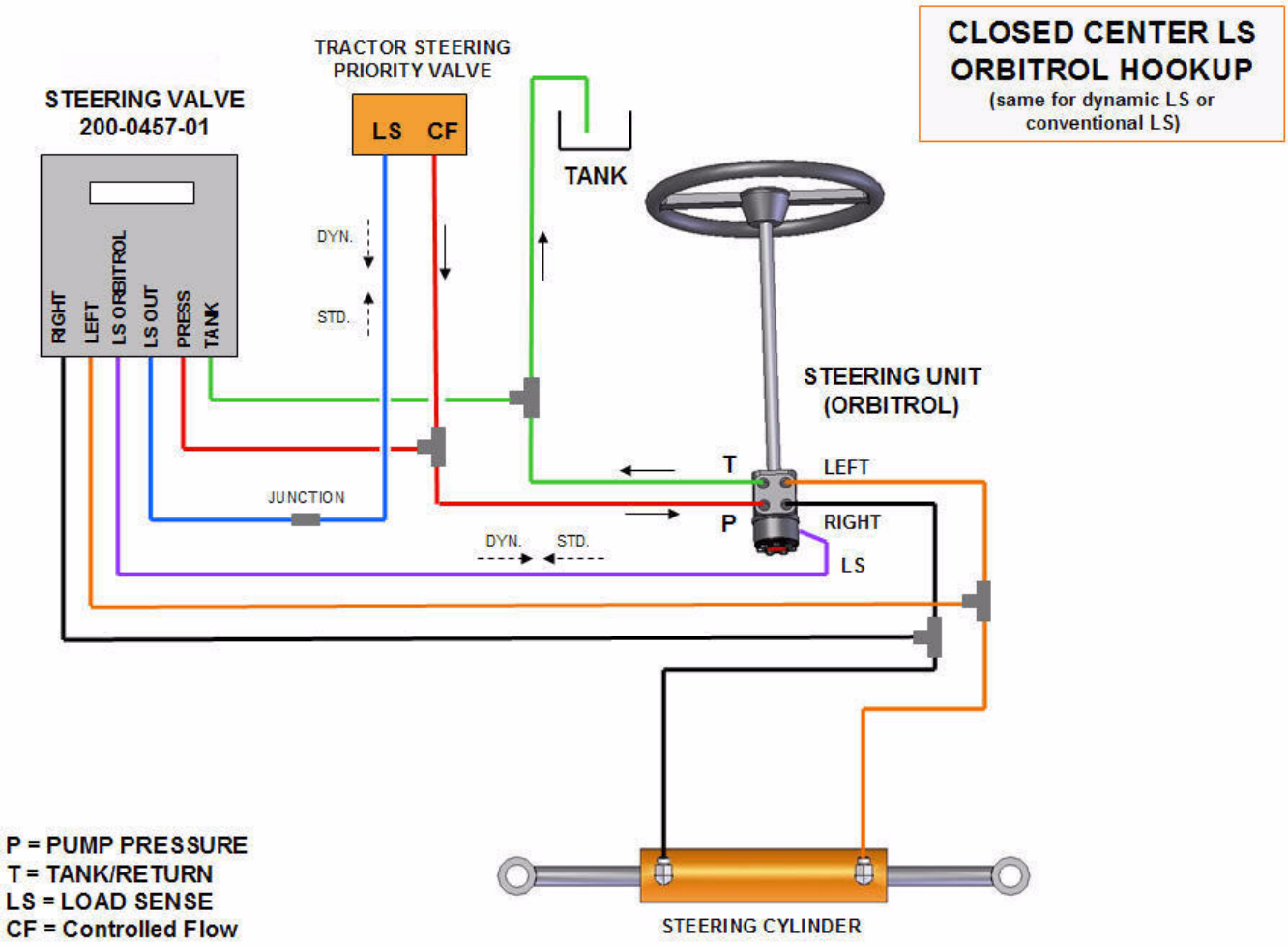
12. Confirm the AutoSteer valve is configured internally for a Closed Center Load Sense Orbitrol installation with the correct orifices and/or plugs installed as shown in *Table 3-4*.
13. Adjust the Relief Valve.
14. Proceed to system calibration and tuning.

Note: If access to the Orbitrol is difficult and does not enable the installation of run tees on the Pressure and Tank ports, you can install the run tees in another location along the same hoses.

Figure 3-18 Typical Orbitrol Hose Connections

Installation Diagram

Figure 3-19 Closed Center Load Sense Orbitrol Installation Diagram



Closed Center Load Sense Power Beyond Installation

Use this valve installation when the vehicle has a closed center non-reacting Orbitrol with a Load Sense line and a Power Beyond system available. Power Beyond is typically only found on vehicles with implements and is used for powering hydraulically driven implements. The Power Beyond system must have Pressure, Tank and LS ports available. The closed center Orbitrol may get its oil supply from a variable displacement flow and pressure compensated pump or a fixed displacement gear pump with an LS steering Priority Valve. This installation is preferred and can be simpler to install when the vehicle has a Power Beyond system available.

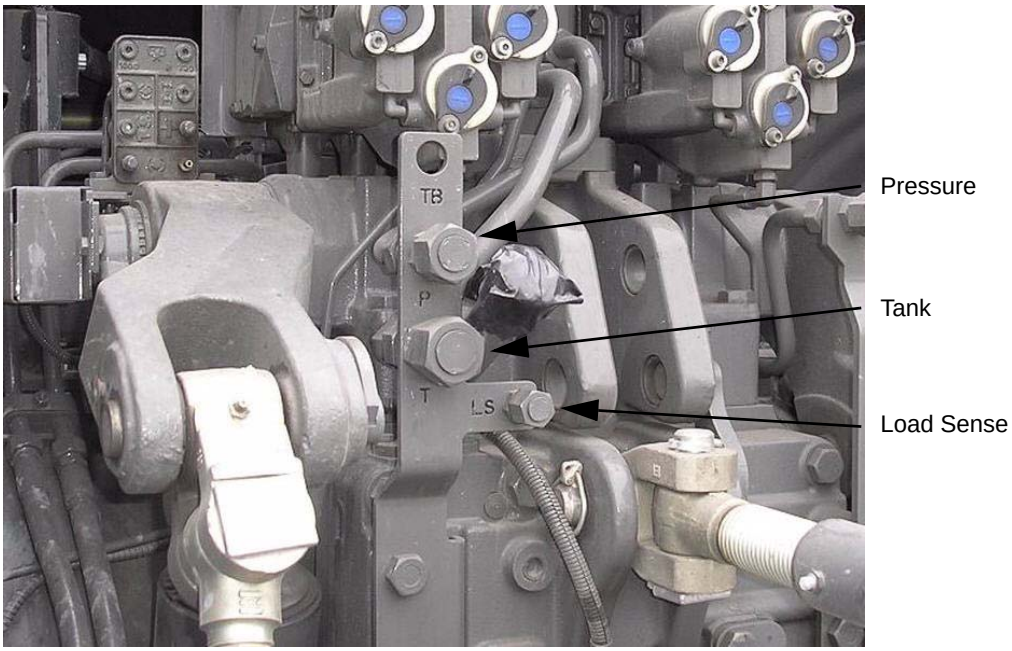
The AutoSteer Pressure, Tank and LS hoses are connected to the vehicle Power Beyond system which is independent of the vehicle steering system. A LS Relief Valve inside the AutoSteer valve limits the maximum LS pressure and therefore limits the maximum pump pressure for AutoSteering. A second LS hose is teed into the Orbitrol LS hose for detecting the pressure spike created when the driver turns the steering wheel. The pressure transducer signal is used to kick-out AutoSteer when the driver turns the steering wheel. The AutoSteer Right and Left steering hoses are teed into the vehicle steering lines and sends oil directly to the steering cylinders. The non-reactive Orbitrol keeps the steering wheel stationary while AutoSteering.

Note: Do not use this installation with the following vehicle types:

- Vehicles with a reactive (self centering) steering system.
- Very large vehicles which may require a higher oil flow and a larger AutoSteer valve.
- Vehicles with an Open Center steering system.
- Pressure compensated vehicles without an Orbitrol LS hose.
- Vehicles without Power Beyond available.
- Vehicles using separate oil reservoirs for steering and Power Beyond.

Note: Ensure the steering system and Power Beyond systems share the same oil reservoir before proceeding with this installation.

Figure 3-20 Typical Power Beyond Port Connections



Valve Configuration

The AutoSteer valve has two internal plugs and orifices that must be configured to adjust the valve Load Sense circuit for different types of installations. *Table 3-5* provides the recommended plug configuration also for reference and troubleshooting purposes.

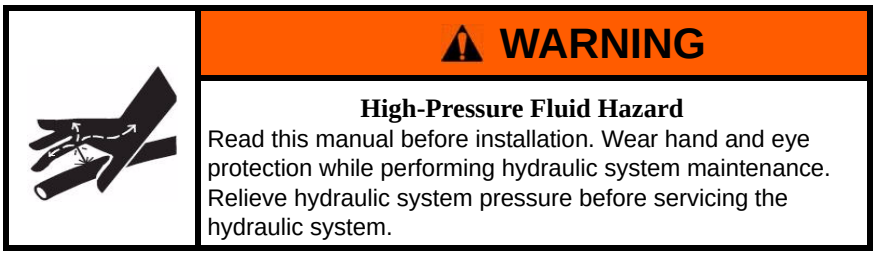
In this Power Beyond installation you must replace a blind plug with an orifice and also install a blind plug as specified in *Table 3-5*.

Table 3-5 AutoSteer Valve Plug and Orifice Configuration

Type of Installation	13A	13B
Factory Default Configuration (valve as-delivered)	PLUG	OPEN
Closed Center Orbitrol + Power Beyond	0.022” ORIFICE	PLUG

Note: The 0.022” orifice recommended for position 13A is only required on vehicles without an internal LS bleed-down orifice on their Power Beyond system. Always install an orifice in position 13A on vehicles without an LS bleed-down. Failure to install this orifice will result in the Power Beyond pump remaining stroked up to a high pressure when AutoSteer is not turning the wheels. The Power Beyond pump pressure should drop immediately when the valve is not turning the wheels.

Installation Instructions


WARNING
High-Pressure Fluid Hazard
Read this manual before installation. Wear hand and eye protection while performing hydraulic system maintenance. Relieve hydraulic system pressure before servicing the hydraulic system.

1. Refer to *Figure 3-21* for a detailed hose diagram and follow the instructions below.
2. Connect a hose from the **Press** port on the AutoSteer valve to the Pressure port on the vehicle Power Beyond system. Use a quick coupler or hose adapter matching the vehicle Power Beyond port. This hose will provide oil pressure to the AutoSteer valve on demand.
3. Connect a hose from the AutoSteer valve Tank port to the vehicle Power Beyond system Tank port. Use a quick coupler or hose adapter matching the vehicle Power Beyond port. This hose connects the AutoSteer valve to Tank/Return.
4. Connect a hose from the AutoSteer valve LS OUT port to the vehicle Power Beyond system LS port. Use a quick coupler or hose adapter matching the vehicle Power Beyond port. This hose connects the AutoSteer Load Sense to the vehicle hydraulic system to stroke-up the pump.

Note: *Figure 3-22* shows typical hydraulic hose connections between the AutoSteer valve and Power Beyond.

---

5. Disconnect the Orbitrol LS hose and install a Tee adapter. Reconnect the vehicle LS hose to the Tee adapter.
6. Connect a hose between the AutoSteer valve LS Orbitrol port and the Tee adapter previously installed on the Orbitrol LS port. This hose provides a pressure signal to the AutoSteer pressure transducer enabling AutoSteer kick-out when the driver turns the steering wheel.
7. Connect a hose between the AutoSteer valve Right port and the Orbitrol right steering hose. You may install the Tee adapter anywhere along the Right steering line in a convenient location.
8. Connect a hose between the AutoSteer valve Left port and the Orbitrol Left steering hose. You may install the Tee adapter anywhere along the Left steering line in a convenient location.
9. Individually check both ends of each hose connection and confirm it matches the hose diagram in *Figure 3-21*. Wrong hose connections can cause immediate pump damage when the engine is started.
10. Confirm the AutoSteer valve is configured internally according to *Table 3-5* for a Closed Center Power Beyond installation with the correct orifices and/or plugs installed.
11. Adjust the Relief Valve.
12. Proceed to system calibration and tuning.

Installation Diagram

Figure 3-21 Closed Center Power Beyond Hydraulic Connections

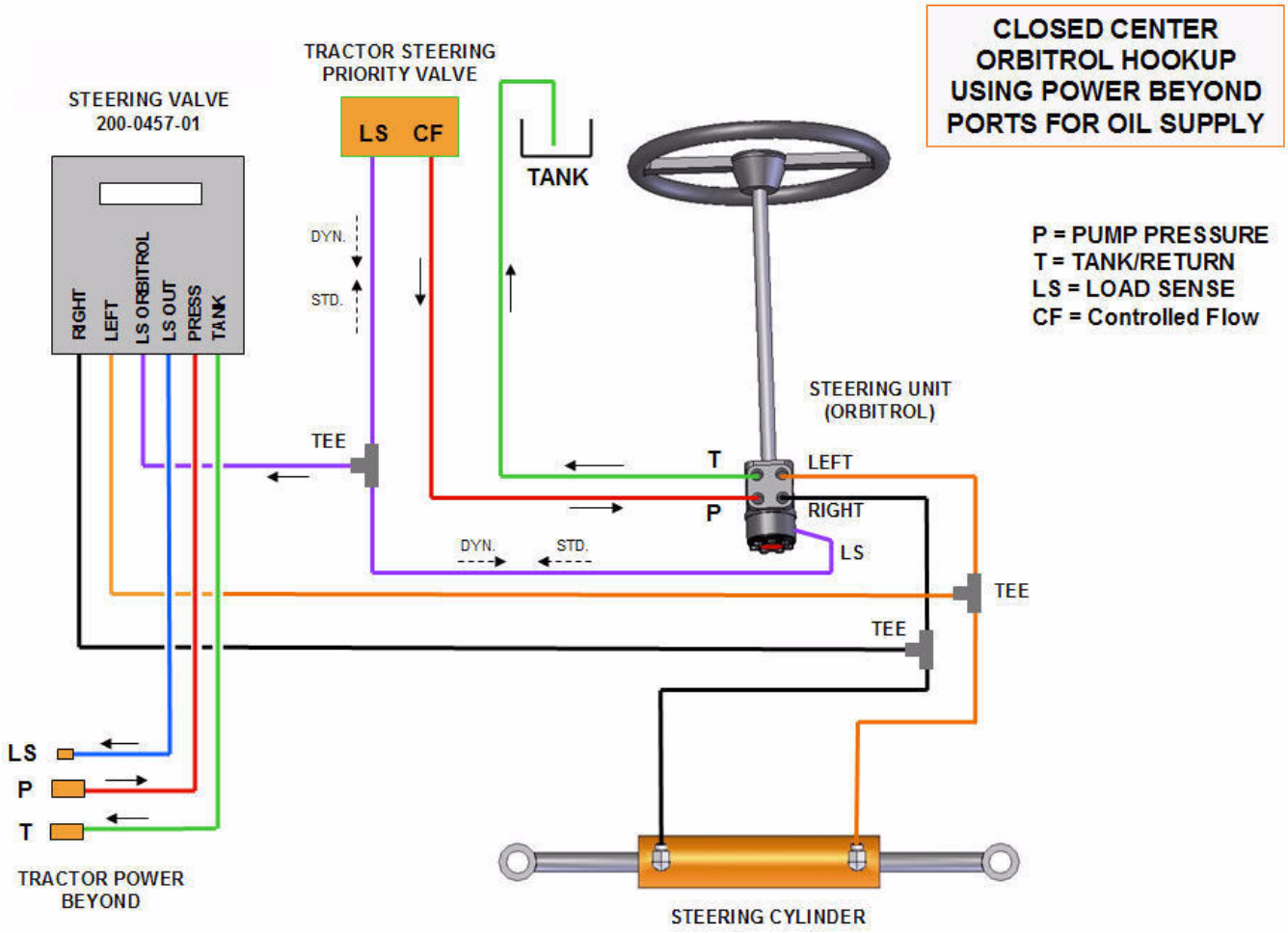
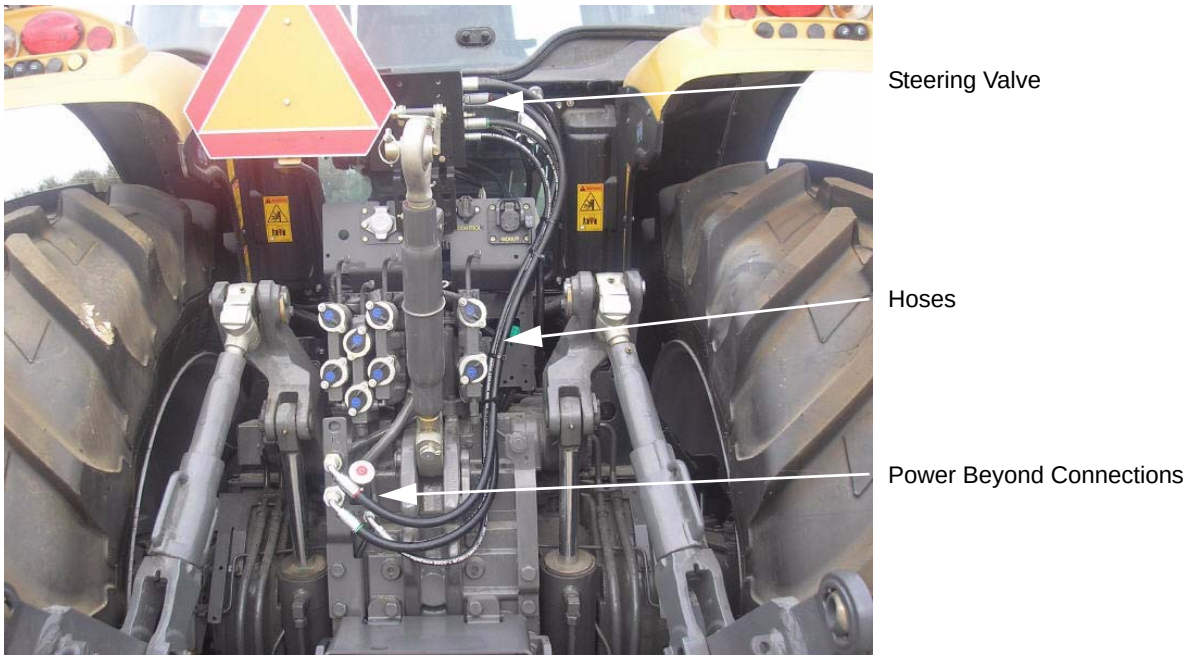


Figure 3-22 Typical Power Beyond Connections



Pressure Transducer

Install the Pressure Transducer on the Steering Valve TRANS port. See *Figure 3-23*.

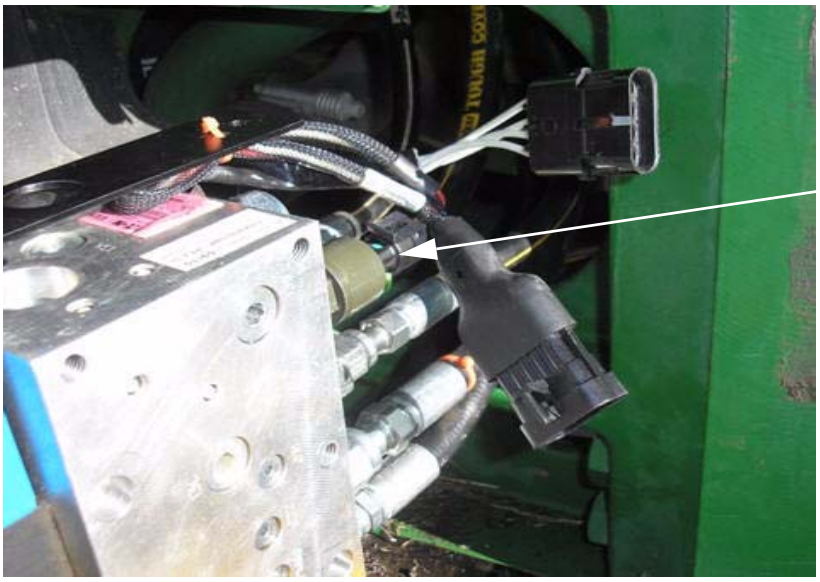
Tighten the pressure transducer with a ¾” wrench.

Note: Do not overtighten the Pressure Transducer.

Connect the short transducer harness to the Pressure Transducer. See *Figure 3-23*.

Note: Loop the excess harness inside the rear valve cover and secure with a small cable tie on the two holes on the rear Steering Valve cover.

Figure 3-23 Pressure Transducer Installation



Connect the Steering Valve 4-pin connector and 10-pin connectors to the SA Module Harness.

Note: Secure the Pressure Transducer cable and connector with cable ties in a protected position.

Adjusting the AutoSteer Relief Valve

The AutoSteer valve has a built-in Load Sense Relief Valve which limits the maximum pump pressure during AutoSteering. The Relief Valve must be adjusted after you have completed the hydraulic installation and before you turn on the AutoSteer system.

Note: The AutoSteer system must be fully installed and functional before you can adjust the Relief Valve.

Note: The Relief Valve in *Figure 3-24* is shown on a bench without the hydraulic hoses connected for ease of viewing the adjustment process. When you adjust the Relief Valve, it is done with the valve mounted on the vehicle and the hydraulic hoses connected.

Figure 3-24 AutoSteer Relief Valve Adjustment

⚠ WARNING

To prevent the vehicle from running over a person, you must never leave the vehicle while the AutoSteer system is engaged. Do not have people around the vehicle while the engine is running.

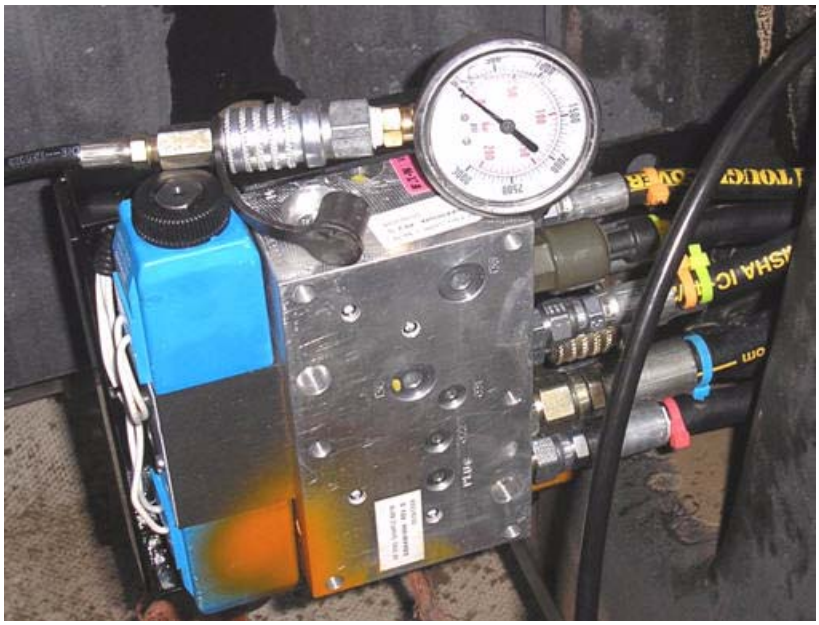
Follow the procedure below to adjust the Relief Valve:

⚠ WARNING

Do not stand close to the wheels and do not move the vehicle while you are adjusting the Relief Valve. Turn off the engine, put the transmission into “park” position and engage the parking brake before standing under or next to the vehicle.

1. Install a 5000 psi pressure gauge on the AutoSteer valve diagnostics port labeled as GP. Use a short extension hose on the pressure gauge if necessary for easier reading. See *Figure 3-25*.

Figure 3-25 Pressure Gauge (different vehicle shown)



2. Put transmission into Park position and set the hand brake.
3. Start the engine and set it at low idle.
4. Immediately check for oil leaks on all previously opened hose connections.
5. Turn the steering wheel full right and then full left to check for correct manuals steering response.

Note: Air in the hoses may cause a slight steering delay when the system is first powered up.

6. Observe the standby pump pressure shown on your pressure gauge. Standby pressure should be very low, around 300psi. If standby pump pressure is zero or less than 100psi, you might have inverted the Pressure and Tank hoses.
7. Clear any bystanders from around the vehicle in preparation for moving the front wheels.
8. With the display turned ON access the **Hydraulic Valve** window from the **Steering Components** Window and command the steering full Right and full Left. The front wheels will turn towards each of the directional stops. The maximum pump pressure will be indicated on the pressure gauge when the wheels hit the stops.
9. Adjust the AutoSteer Relief Valve so that the maximum pump pressure is approximately the same as the maximum manual steering pressure when the wheels hit the stops.

Note: The maximum manual steering pressure value can be obtained from the vehicle shop manual or measured by installing a pressure gauge on one of the hydraulic steer lines.

10. Tighten the jam nut on the Relief Valve once the correct pressure setting has been adjusted.
11. Remove your pressure gauge by sliding the sleeve on the quick coupler.

Note: Turn off the engine before adjusting the Relief Valve. Turning the engine off prevents possible vehicle movement or a high pressure fluid hazard. Do not adjust the Relief Valve with the engine running.

1. Install the front valve cover. See *Figure 3-26*.
2. Tighten the four Allen screws with a hex key.

Figure 3-26 Replacing the Steering Valve Cover

AutoSteer Valve Installation Checklist

1. Ensure the valve bracket bolts are tight. ☐
2. Ensure the valve mounting screws are tight. ☐
3. Ensure the Pressure hose is connected to correct AutoSteer Valve and vehicle ports. ☐
4. Ensure the Tank hose is connected to correct AutoSteer Valve and vehicle ports. ☐
5. Verify the LS-OUT hose connected to correct port at both ends. ☐
6. Verify that both ends of the LS ORBITROL hose are connected correctly. ☐
7. Verify that both ends of the Right Steer hose are connected correctly. ☐
8. Verify that both ends of the Left Steer hose are connected correctly. ☐
9. Ensure the Pressure Transducer installed and tight. ☐
10. Ensure all hose fittings are tight. ☐
11. Check hose routing and ensure cable ties are on all hoses. ☐
12. Ensure all hoses are clear of moving parts, such as the engine drive shaft and front axle shaft. ☐
13. Ensure the SA Module Harness is connected to the two valve connectors. ☐
14. Verify the 5000psi pressure gauge is installed on the valve test port. ☐

Wheel Angle Sensor (WAS) Installation

This **Wheel Angle Sensor Installation** chapter information is provided in the following sections:

- *Wheel Angle Sensor Installation Guidelines*
- *Wheel Angle Sensor Installation Tasks*
  - *Mounting Wheel Angle Sensor Hardware*
  - *Cutting Linkage Rods to Length*
  - *Assembling Linkage Rod Hardware*
  - *Attaching and Adjusting Wheel Angle Sensor Linkage Rods*

Wheel Angle Sensor Installation Guidelines

The following guidelines should be considered before beginning the Wheel Angle Sensor installation process:

1. Install the Wheel Angle Sensor in a protected position to avoid damage from tall crops or debris.

2. Orient the Wheel Angle Sensor so the potentiometer is pointing upwards to avoid water intrusion.

3. The linkage arms should have enough clearance to rotate freely from a full left to a full right turn.

4. Adjust the length of the linkage arms until you get approximately 48000 counts during steering calibration. If you are doing an installation on a new vehicle, start with longer linkage arm lengths and shorten as necessary to get approximately 48000 counts during steering calibration.

5. To avoid damage to the potentiometer, do not rotate beyond the travel stops (approximately,180 degrees).

6. To make fine adjustments to the potentiometer angle, loosen the two screws securing the potentiometer and rotate the potentiometer.

7. The Wheel Angle Sensor bracket must be well secured to the vehicle to avoid changes in position after the steering calibration has been completed.

8. Avoid installing the Wheel Angle Sensor on parts which can move or rotate independently of the steering wheels, such as the steering cylinders and the tie rods with ball joints.

9. Perform steering calibration after any Wheel Angle Sensor or linkage position changes.

10. Many vehicles, combines and sprayers have custom designed brackets and linkages available from your AutoSteer dealer for the Wheel Angle Sensor. On all other machines you must fabricate special mounting brackets according to available steering axle mounting points.

11. Route the sensor cable in a safe position away from moving or hot parts.

12. Secure the sensor cable with cable ties.

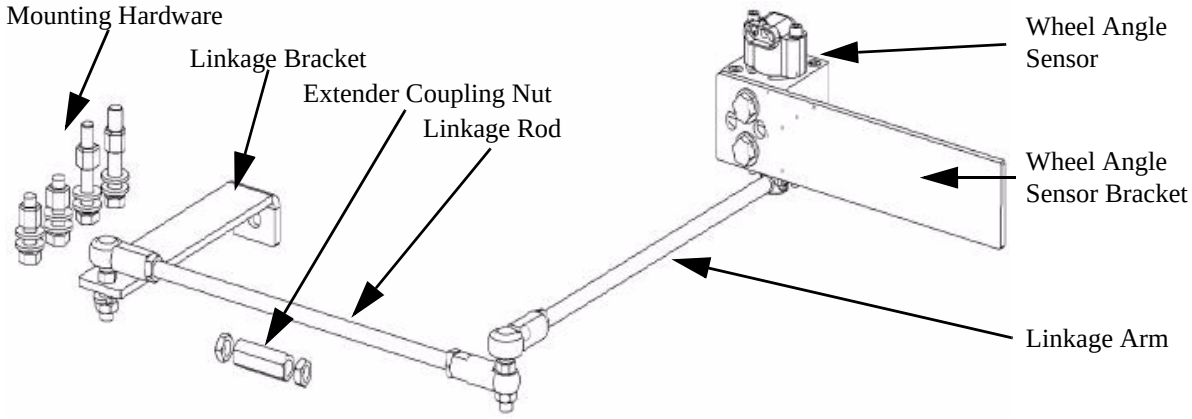
13. Tighten all screws, bolts and nuts after the Wheel Angle Sensor has been installed and tested.

Wheel Angle Sensor Installation Tasks

The general Wheel Angle Sensor components are shown in *Figure 4-1*.

Note: The components may require changes and new mounting holes depending on what model vehicle you are installing upon. Some vehicles require making custom brackets.

Figure 4-1 Wheel Angle Sensor Example Components



Mounting Wheel Angle Sensor Hardware

Figure 4-2 through *Figure 4-5* show examples of different custom Wheel Angle Sensor brackets made to fit different vehicles.

Figure 4-2 Wheel Angle Sensor Mounting Bracket (example 1)

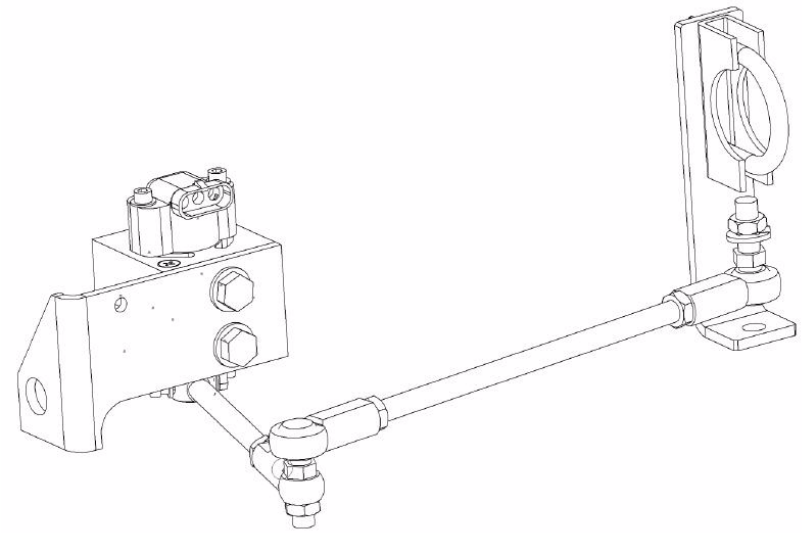


Figure 4-3 Wheel Angle Sensor Mounting Bracket (example 2)

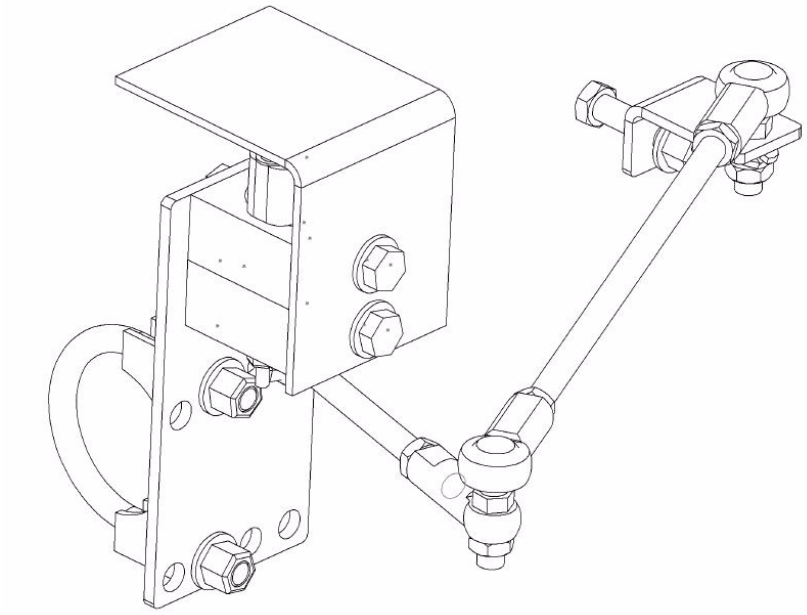


Figure 4-4 Wheel Angle Sensor Mounting Bracket (example 3)

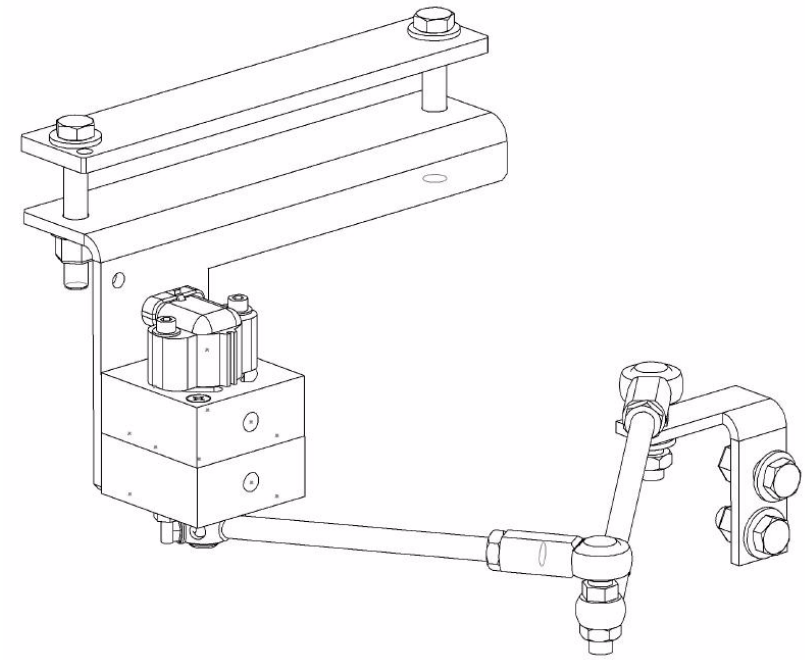


Figure 4-5 Wheel Angle Sensor Mounting Bracket (example 4)

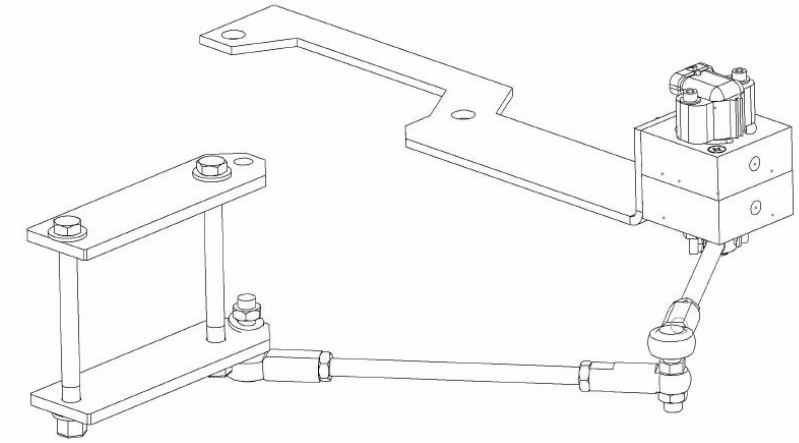


Figure 4-6 through *Figure 4-9* show examples of Wheel Angle Sensor installations.

Figure 4-6 Wheel Angle Sensor Installation (example 1)

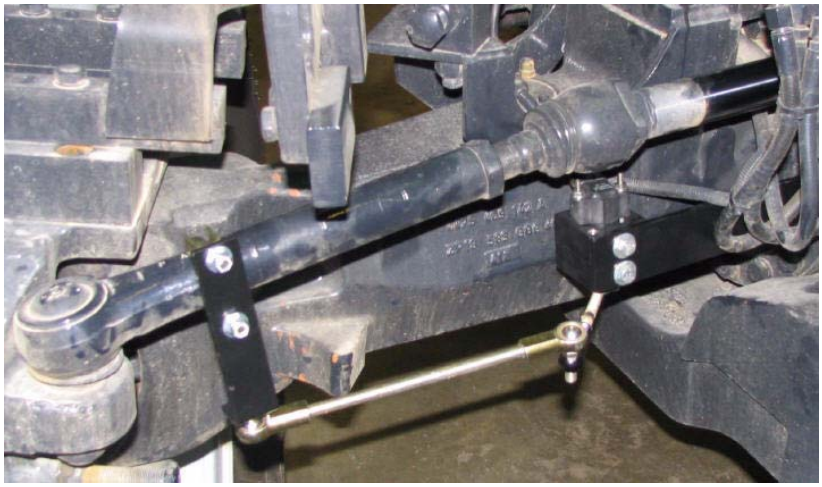
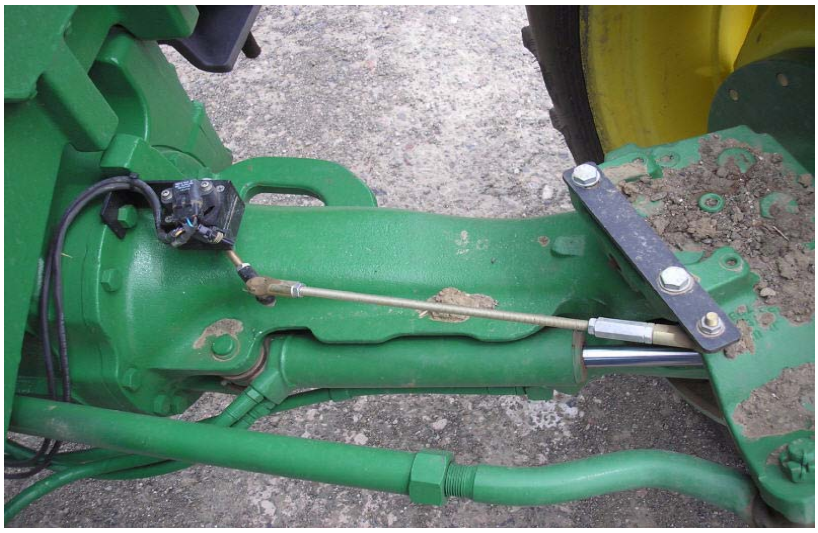


Figure 4-7 Wheel Angle Sensor Installation (example 2)

Figure 4-8 Wheel Angle Sensor Installation (example 3)

Figure 4-9 Wheel Angle Sensor Installation (example 4)



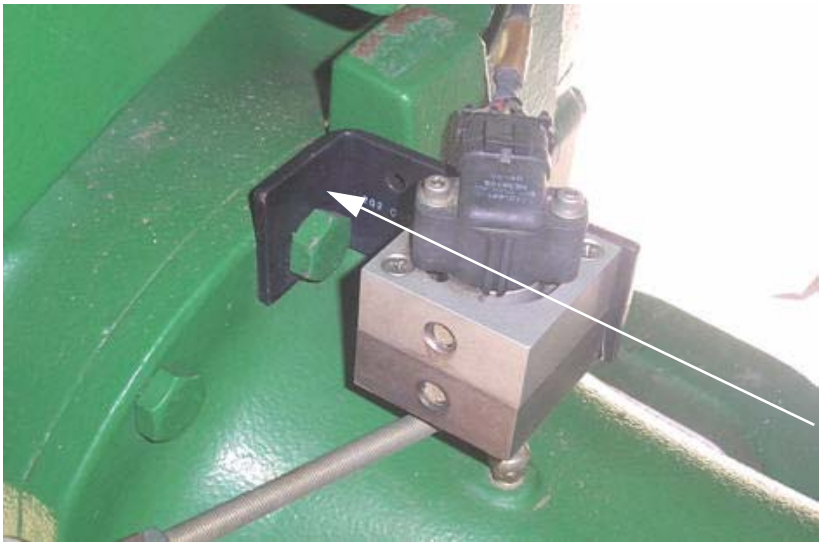
The Wheel Angle Sensor is shown in *Figure 4-10* through *Figure 4-12*. Mount the linkage bracket to a moving part on the steering axle such as a tie rod, or wheel knuckle. Mount the angle sensor bracket to a part that doesn't move such as the axle. When the wheels are turned, the linkage bracket should move relative to the angle sensor bracket. The linkage arm and rod rotate the angle sensor when the wheels are turned. The standard linkage lengths are 12" but can be cut to a shorter length as necessary.

Note: A coupling nut and jam nuts are provided to enable extending the threaded rods, if necessary.

Figure 4-10 Linkage Bracket Mounting (front view)

Figure 4-11 Linkage Bracket Mounting (side view)

Figure 4-12 Wheel Angle Sensor Bracket

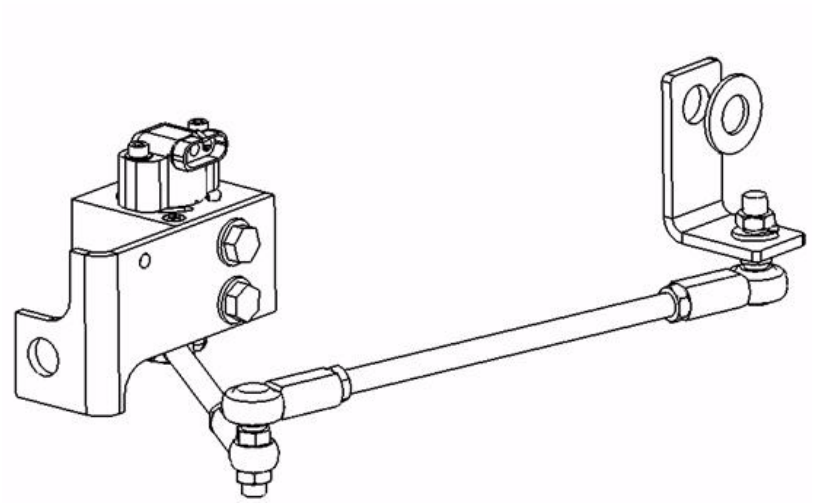


Adjust linkage arm length and/or linkage bracket position to obtain approximately 48000 counts. Turn the vehicle all the way right and left to make sure the linkage arms can move without interference.

Note: This step is done after final assembly during the calibration and tuning steps. Do not turn the steering until the installation is complete and the count is confirmed in the Examine Steering screen.

Note: The threaded linkage rods must be cut to the correct lengths before final assembly. The linkage rods are shown assembled in *Figure 4-13*.

Figure 4-13 Assembled Wheel Angle Sensor Assembly Example



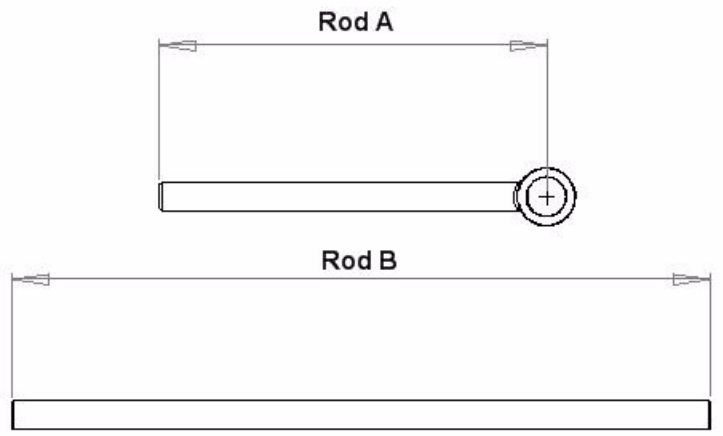
Cutting Linkage Rods to Length

Measure and mark the two rods for cutting, according to the required length.

Note: The Wheel Angle Sensor rods are shipped longer than they need to be. These rods must be cut to the proper length to allow the linkage rods to provide the Wheel Angle Sensor the maximum number of counts as the steering wheel is turned from full right to full left. Due to the variability of the possible mounting positions and axle options, it is left to the installer to verify the correct length for each individual installation and to cut the rods to length. Before cutting the linkage rods, verify the Wheel Angle Sensor brackets will attach to the vehicle as shown in this manual. If this is not possible, do not cut the rods until a workable length is determined for your installation. The installer is responsible for ensuring the rods are cut to the proper length.

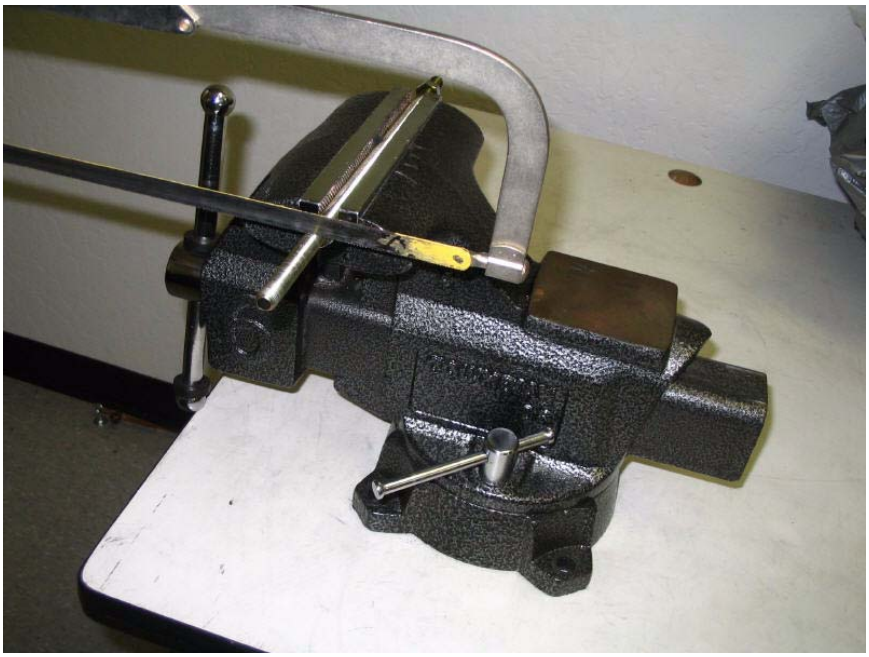
Note: *Figure 4-14* shows the measurement points used to properly cut the linkage rods.

Figure 4-14 Linkage Rod Cut Length Measurement Points



Use a hack saw to cut the linkage rod to length while it is held in a bench vise. See *Figure 4-15*.

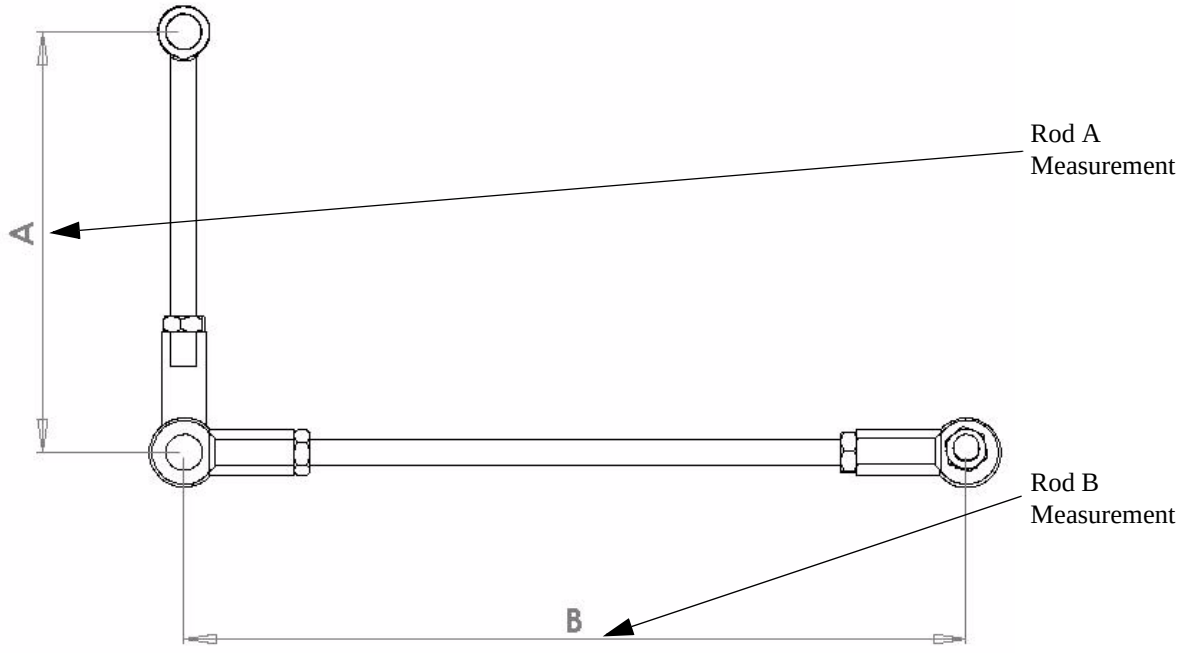
Figure 4-15 Linkage Rod Cutting



Assembling Linkage Rod Hardware

Note: *Figure 4-16* shows the measurement points for the assembled linkage rods.

Figure 4-16 Linkage Rod (Assembled) Measurement Points

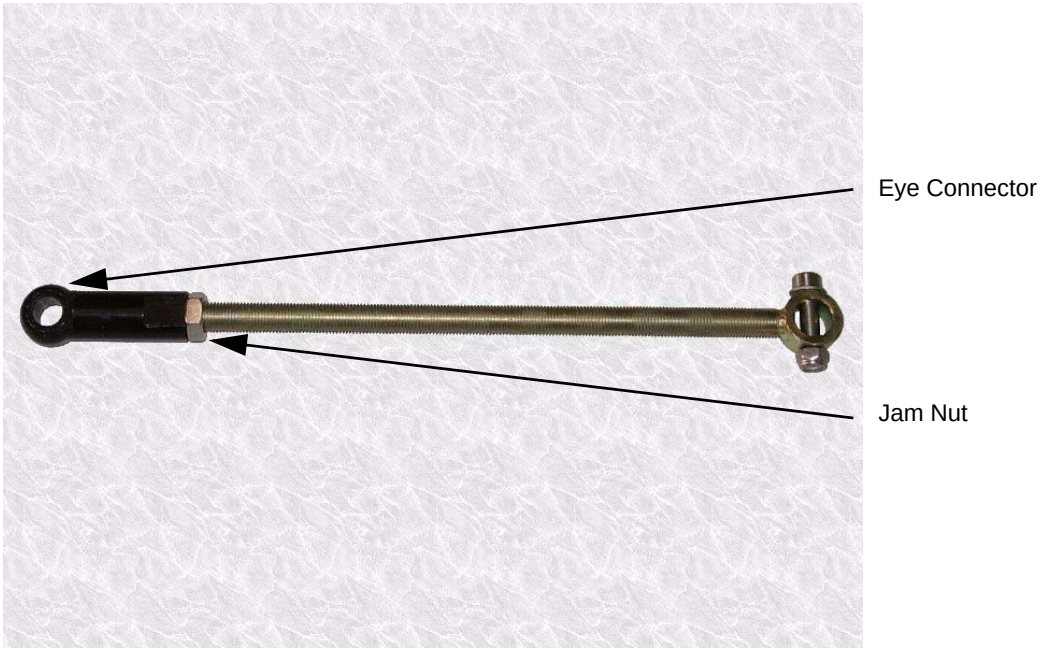


Note: The threaded rods must be cut to the correct lengths before final assembly.

Attach a jam nut to the linkage Rod A end. See *Figure 4-17*.

Connect the eye connector to the Wheel Angle Sensor linkage rod end. As shown in *Figure 4-17*.

Figure 4-17 Rod A Assembled

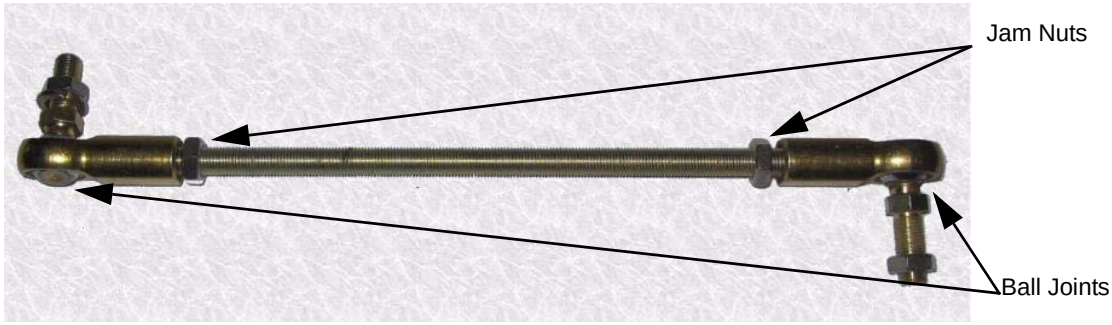


Attach the jam nuts to each end of linkage Rod **B**

Attach the ball joints to both linkage Rod **B** ends as shown in *Figure 4-18*.

Note: This installation requires the bolts for the ball joints should be facing the opposite direction as shown in *Figure 4-18*.

Figure 4-18 Linkage Rod Assembled



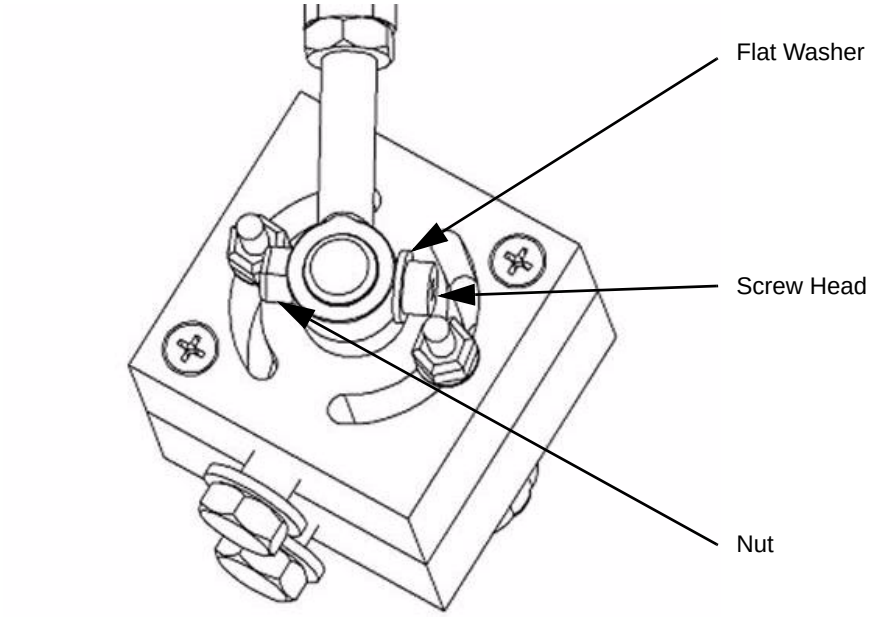
Attaching and Adjusting Wheel Angle Sensor Linkage Rods

Install the short linkage arm on the Wheel Angle Sensor shaft.

Ensure a flat washer is placed under the screw head when attaching the linkage rod to the sensor shaft. See *Figure 4-19*.

Note: The washer should be on the bolt head side and not the assembly nut side.

Figure 4-19 Washer on Shaft Screw



Note: Do not turn the wheels or drive the vehicle before the Wheel Angle Sensor has been adjusted using the AutoSteer Calibration screens. The potentiometer can only rotate a maximum of 180 degrees and if it is rotated beyond its mechanical stops, it will be permanently damaged.

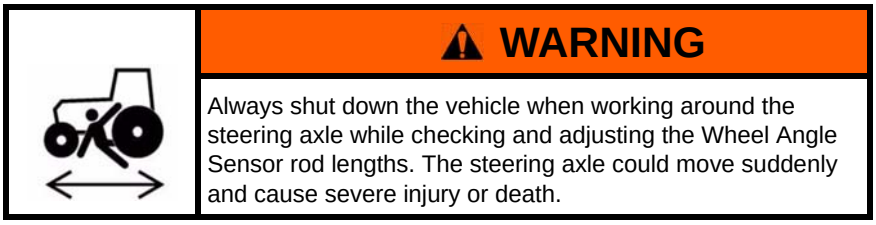
Install the long threaded linkage on the tie rod bracket using a ball joint.

With the linkage rods disconnected, turn the steering wheel so the wheels are centered (the vehicle will travel straight ahead when moving).

Temporarily attach the linkage rods.

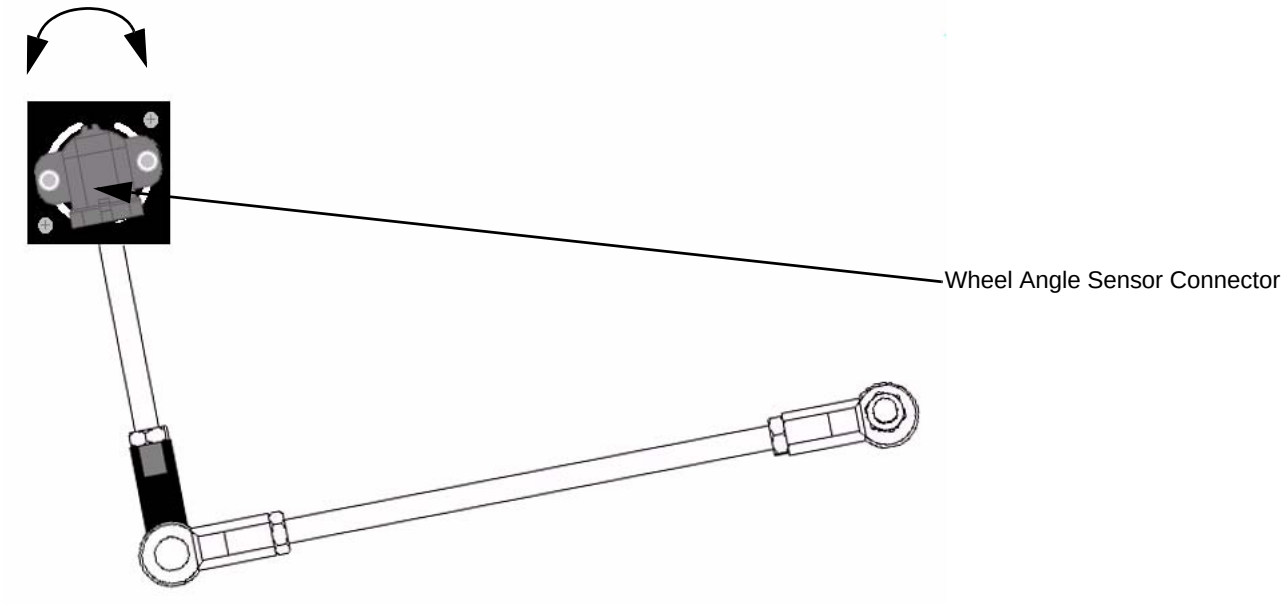
Note: Never leave the linkage rods attached to Wheel Angle Sensor rod and turn the steering wheels manually or automatically until the fit has been verified. The linkage rods must remain apart while the steering wheels are turned to the maximum right and left positions and then temporarily attached at these positions. Failure to disconnect the linkage rods may cause the Wheel Angle Sensor or vehicle to become damaged.

Note: After the linkage rods are assembled, they should move freely without touching any other parts and without overextending. Make any necessary adjustments to the linkage rods, if there is mechanical interference.


WARNING
Always shut down the vehicle when working around the steering axle while checking and adjusting the Wheel Angle Sensor rod lengths. The steering axle could move suddenly and cause severe injury or death.

Rotate the Wheel Angle Sensor potentiometer on top of the mounting block so the wire connector is parallel to the Wheel Angle Sensor linkage rod. See *Figure 4-20*.

Figure 4-20 Adjusting Potentiometer Angle



Tighten the two screws securing the potentiometer to the Wheel Angle Sensor, after final adjustments. See *Figure 4-21*.

Note: Use a 5/32” hex key and a 3/8” wrench to secure the potentiometer. See *Figure 4-21*.

Figure 4-21 Wheel Angle Sensor Potentiometer (shown on bench)

Disconnect the linkage rods and turn the steering wheel manually to the full left position.

Reattach the linkage assembly and verify the sensor will not be damaged.

Adjust the linkage rod lengths as necessary.

Disconnect the linkage rods and turn the steering wheel manually to the full right position.

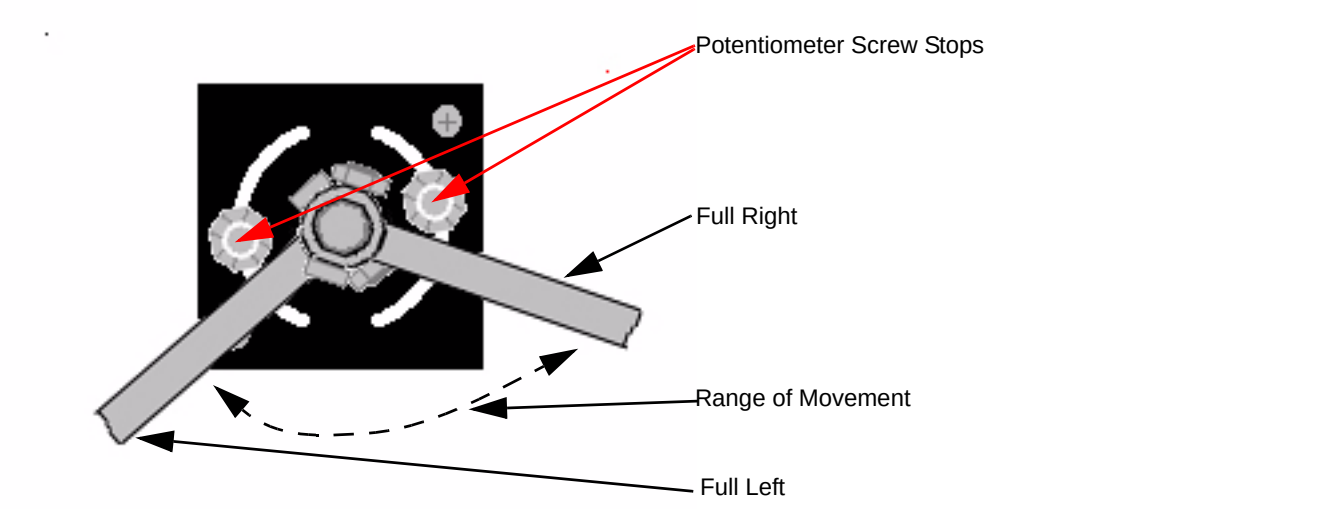
Reattach the linkage assembly and verify the sensor will not be damaged.

Adjust the linkage rod lengths as necessary.

14. Repeat the previous tasks until the linkage rod lengths have been adjusted and the potentiometer is centered to obtain the maximum sensor movement.

Note: The maximum movement is reached when the Wheel Angle Sensor rod sweeps from approximately 3/16 inch (5mm) from the screw stops when the wheels are turned to the maximum right and left positions. See *Figure 4-22*.

Figure 4-22 Maximum Sensor Movement (as seen from bottom)



Note: An Ohm meter can also be used to determine if there is enough sensor movement. Connect the Ohm meter to pins A and B of the Wheel Angle Sensor. Measure the Ohm reading at the maximum left and right position. After subtracting the smaller number from the larger number, there should be at least a 3.75 Kohms change. The reading should also never go below 1.6 or higher than 6.6 Kohms as this is reaching the limits of the potentiometer and could damage the sensor.

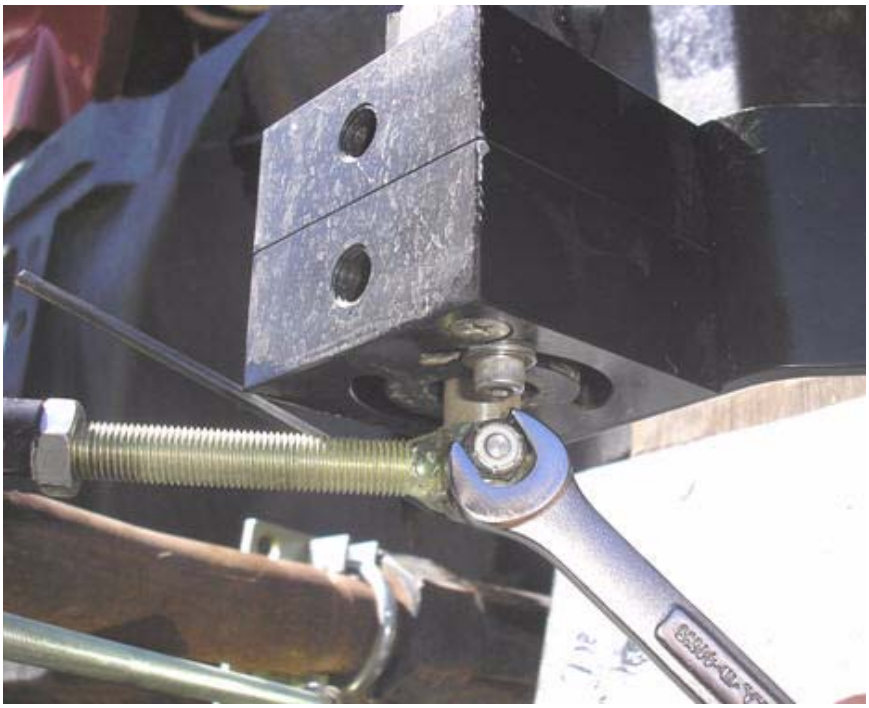
Tighten all linkage rod jam nuts.

Tighten the bolt securing the two linkage rods together. See *Figure 4-23*.

Figure 4-23 Linkage Rod Ball Joint Bolt (different vehicle shown)

Tighten the screw on the sensor shaft. Use a 1/8” hex key and a 3/8” wrench. See *Figure 4-24*.

Figure 4-24 Wheel Angle Sensor Shaft Tightening (different vehicle shown)



Secure the Wheel Angle Sensor cable along the bracket top using cable ties, after the SAM harness is installed.

Note: The AutoSteer system must be fully functional before you can perform *Step*

Adjust the arm length until there are approximately 48000 counts from the Wheel Angle Sensor using the AutoSteer diagnostics screen.

Note: If necessary, shorten Rod A to increase the Wheel Angle Sensor counts.

Tighten all jam nuts and fasteners.

Figure 4-25 shows an example of a completed Wheel Angle Sensor installation.

Figure 4-25 Wheel Angle Sensor Installation Complete

SA Module Installation

This **SA Module Installation** chapter contains information for mounting the SA Module bracket and installing the SA Module.

Note: The components may require changes and new mounting holes depending on the model vehicle you are installing upon. Some vehicles require making a custom bracket.

Figure 5-1 and *Figure 5-2* show examples of SA Module installation locations on various vehicles.

Figure 5-1 SA Module Location (example 1)

Figure 5-2 SA Module Location (example 2)

Note: The recommended SA Module mounting orientations are shown in *Figure 5-3*. The incorrect SA Module mounting orientations in shown in *Figure 5-4*.

Figure 5-3 Recommended SA Module Orientation

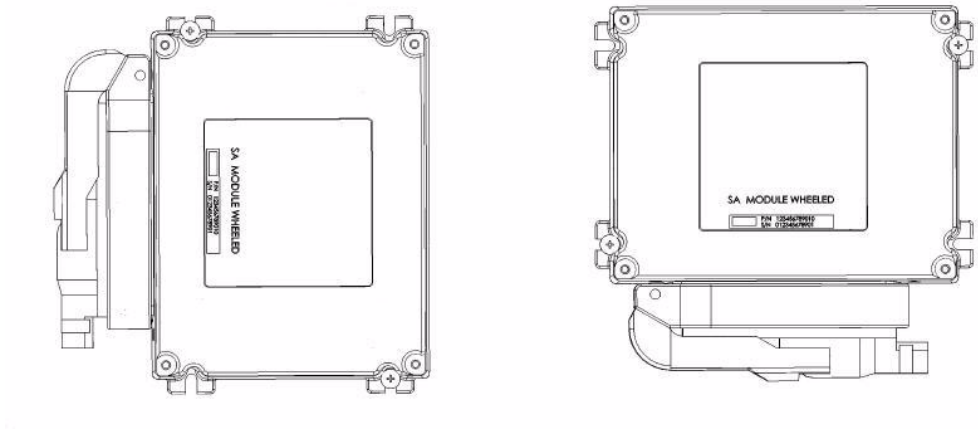
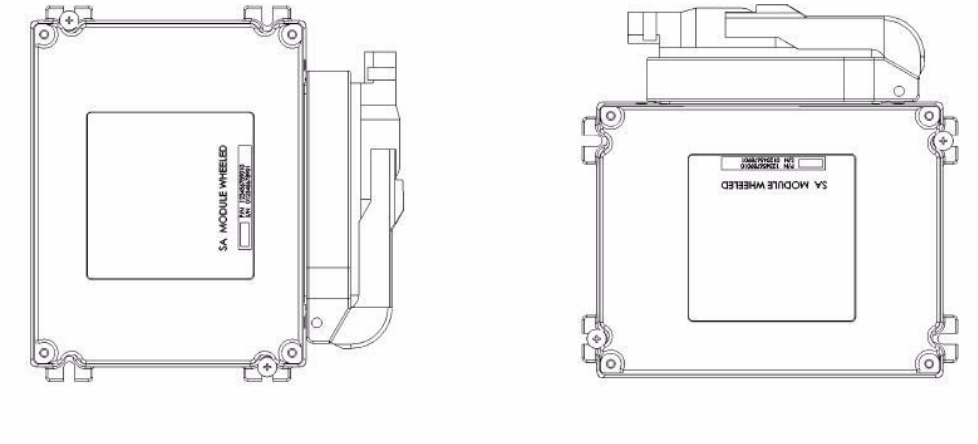
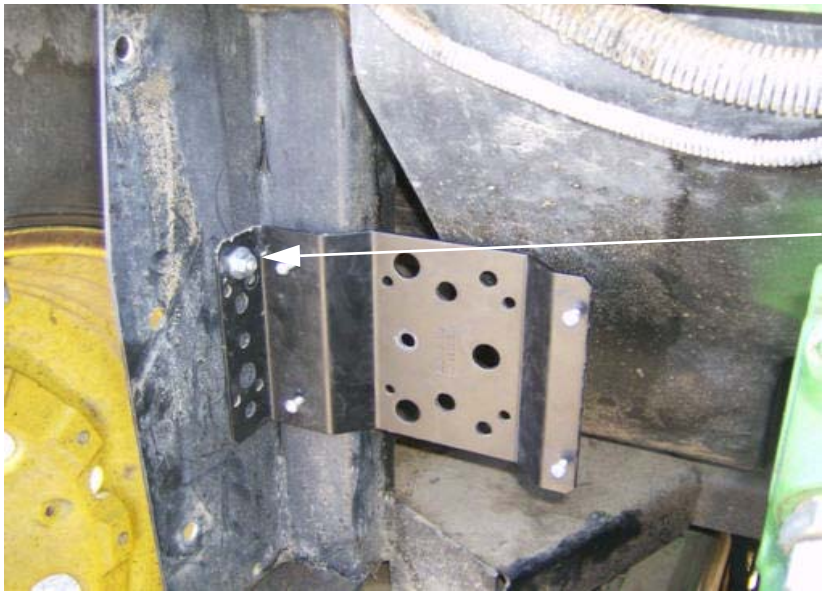


Figure 5-4 Incorrect SA Module Orientation



Mount the SA Module bracket in a protected position using existing bolts and holes if available. You can drill holes on the vehicle to secure the SA Module, if necessary. See *Figure 5-5*.

Figure 5-5 SA Module Bracket Installed



Mount the SA Module to the bracket and secure using four Phillips screws. See *Figure 5-6*.

Figure 5-6 Mounting the SA Module to the Bracket

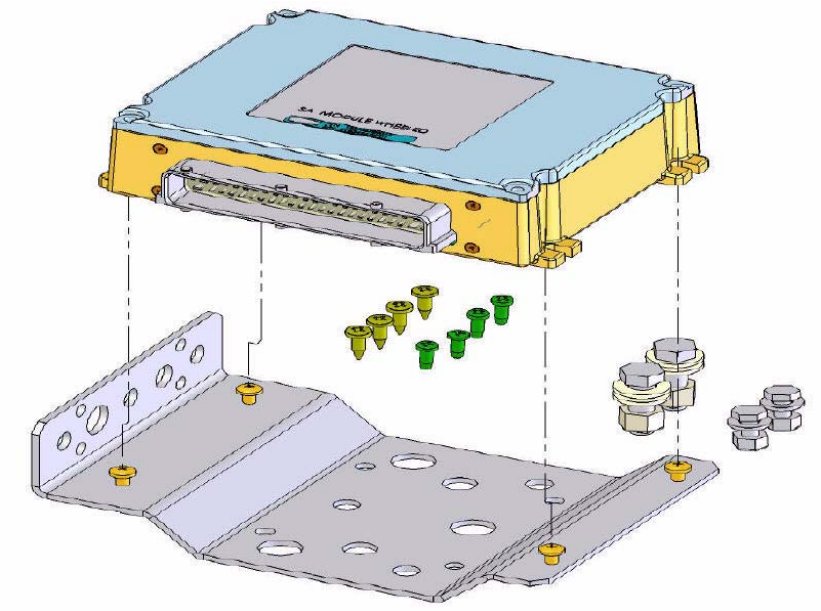


Figure 5-7 shows an SA Module installation example.

Figure 5-7 SA Module Mounted

Note: The SA Module Harness must be routed in a protected position to avoid damage from moving parts.

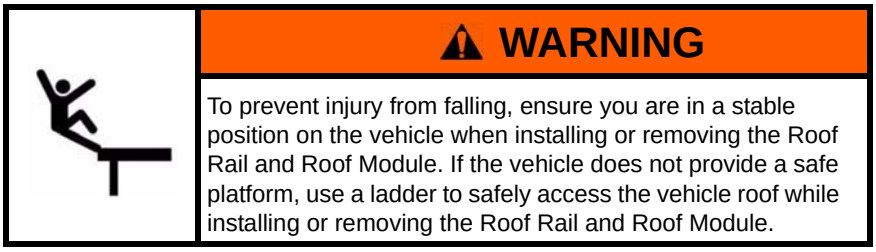
Roof Module Installation

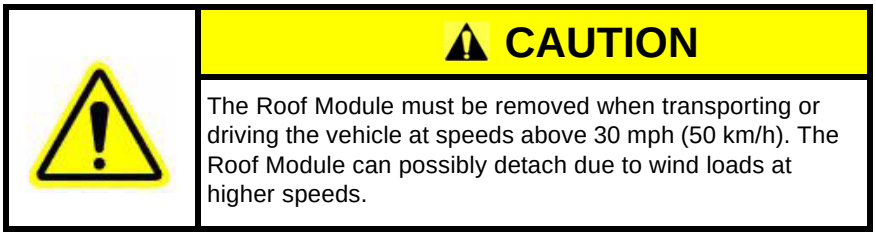
This **Roof Module Installation** chapter contains information in the following sections:

- *Safety Notes*
- *Roof Module Installation Tasks*

Safety Notes

- The AutoSteer system must be powered OFF when installing or removing the Roof Module.
- The Roof Module must always be firmly secured to the Roof Rail using the provided hardware whenever the vehicle is in operation to prevent the Roof Module from releasing from its bracket and falling.
- The Roof Module must be removed when transporting the vehicle at speeds above 30 mph (50 kph).
- Ensure you are in a safe position when attempting to access the cab roof. If necessary for safety, use a ladder to access the roof. Ensure you do not fall or drop the Roof Module.

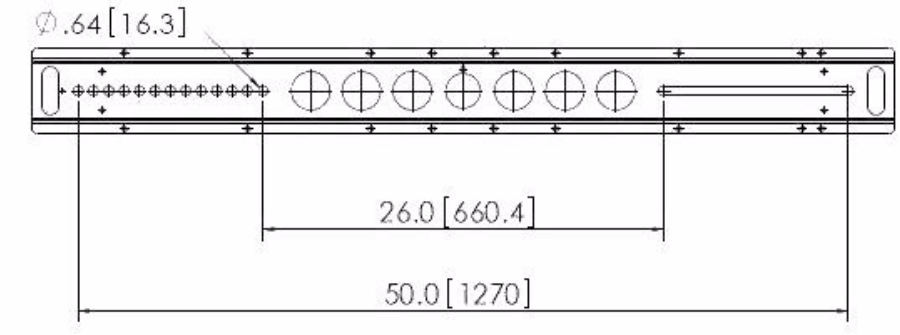

WARNING
To prevent injury from falling, ensure you are in a stable position on the vehicle when installing or removing the Roof Rail and Roof Module. If the vehicle does not provide a safe platform, use a ladder to safely access the vehicle roof while installing or removing the Roof Rail and Roof Module.


CAUTION
The Roof Module must be removed when transporting or driving the vehicle at speeds above 30 mph (50 km/h). The Roof Module can possibly detach due to wind loads at higher speeds.

Roof Module Installation Tasks

The Roof Rail supports the AutoSteer Roof Module and should be installed over the cab or in another high position with a clear sky view. The Roof Rail has several holes and a long slot to accommodate the existing bolt spacing on the cab roof as shown *Figure 6-1*.

Figure 6-1 Roof Rail[1]



The Roof Rail can be directly mounted on the cab roof using two existing bolts if the bolt spacing is between 26.0” and 50.0”. The two bolts must be at least 1/2” (12 mm) diameters and no larger than 5/8” (16mm) diameter. The two bolts must be threaded directly into the cab and have sufficient threads for a secure installation. Use longer bolts if necessary. Spacer washers can be used to elevate the mounting rail and clear the curvature found on some roofs. *Figure 6-2* show a Roof Rail bolted to a vehicle cab roof.

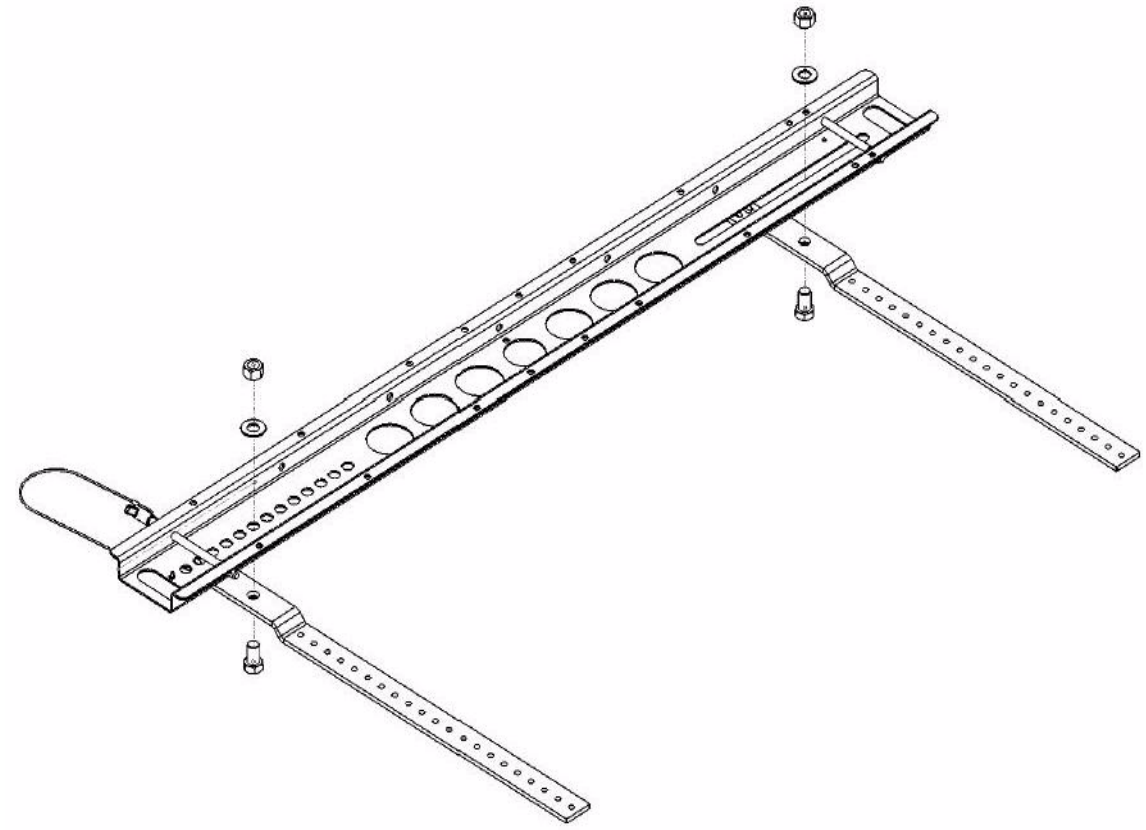
Figure 6-2 Mounting Bolt Locations

1. Dimensions in inches and millimeters.

Note: *Figure 6-3* shows the recommended mounting brackets you should use when the cab roof does not have two strong bolts of at least 1/2” (12 mm) diameter.

Secure the two brackets on the cab roof using two screws for each bracket. You can use smaller screws to secure these brackets, typically 1/4” (6.35 mm) or 5/16” (8mm). These brackets fit smaller screws found on some vehicle cabs. The brackets have a series of holes plus one slotted hole to accommodate different screw spacings.

Figure 6-3 Rail Brackets



Some vehicles do not have bolts or screws available on the cab roof and require custom brackets for mounting the mounting rail. *Figure 6-4* and *Figure 6-5* show examples of custom brackets.

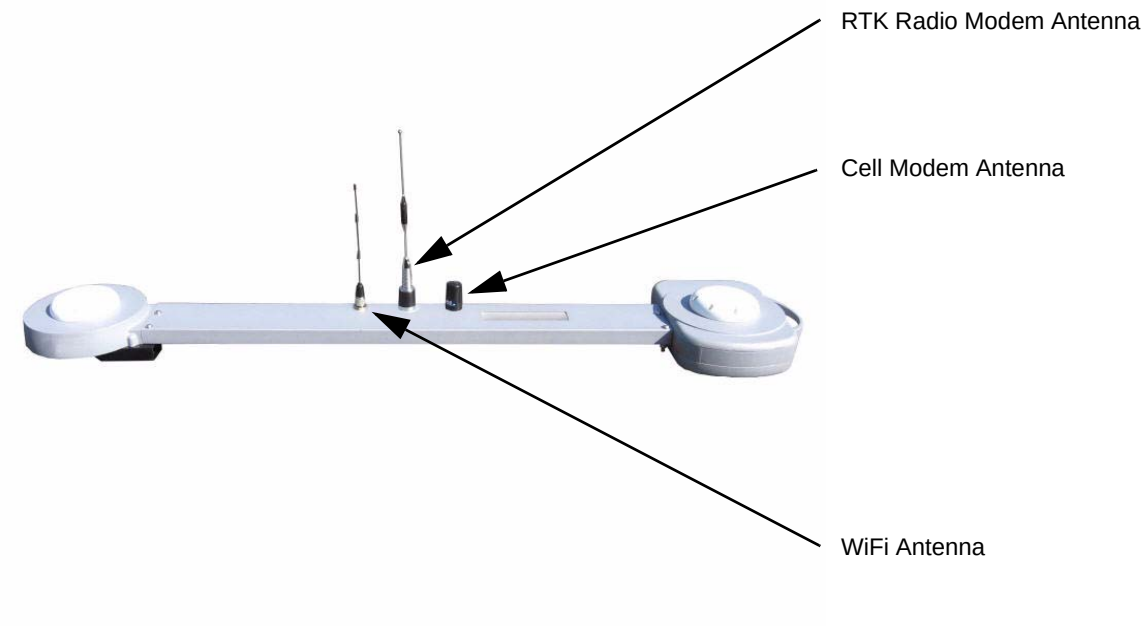
Figure 6-4 Custom Mounting Rail Brackets (example 1)

Figure 6-5 Custom Mounting Rail Brackets (example 2)

Attach the antennas to the AutoSteer Roof Module.

Note: The antennas should be attached hand tight. Do not use any tools to tighten the antennas.

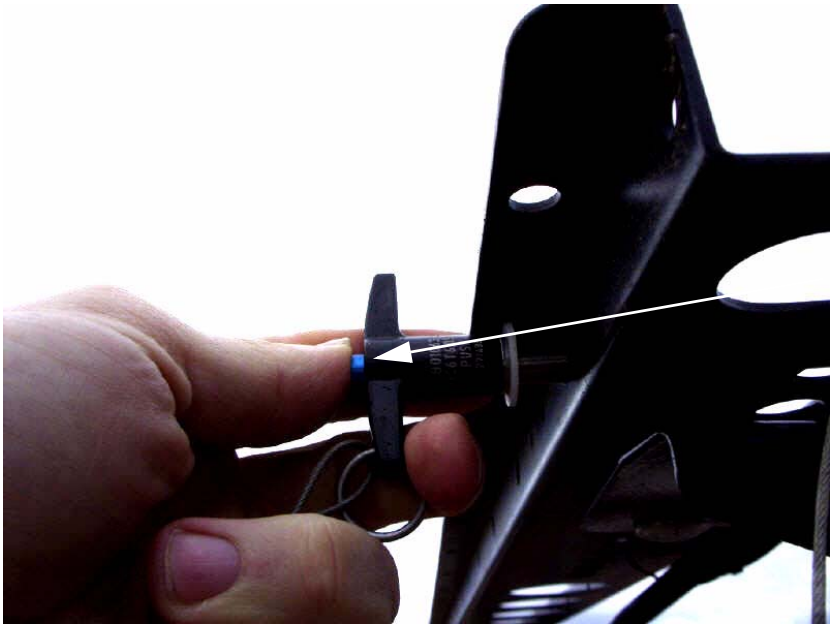
Figure 6-6 Antennas Attached to the Roof Module



Remove the locking pin from the Roof Rail. See *Figure 6-7*.

Note: Press the button on the handle end to enable pin removal.

Figure 6-7 Removing the Quick Release Pin



Place the Roof Module on the Roof Rail. See *Figure 6-8*.

Figure 6-8 Mounting Roof Module on Roof Rail

1. Reinsert the locking pin. See *Figure 6-9*.
2. Test the tightness of the Roof Module from side-to-side.

Figure 6-9 Reinserting the Locking Pin

3. The Roof Module is now installed. See *Figure 6-10*.

Figure 6-10 Roof Module Installed

Display Installation

This **Display Installation** chapter provides Display installation information contained in the following sections:

- *Introduction*
- *Installation Examples*
  - *Display Installation Example I*
  - *Display Installation Example II*

Note: Many installations require custom brackets to mount the Display within the cab. The Display bracket should be sufficiently strong to avoid Display vibration when driving over rough terrain. Brackets made from 1/4” (6.35mm) steel plate usually work best. Avoid using thin sheet metal for fabricating Display brackets.

Introduction

Many cabs provide threaded mounting bolt holes or holes for placing threaded mounting inserts. These mounting features can either be visible with threaded plastic screw hole caps or can sometimes be located behind plastic panels. You need to determine the best Display mounting location for your specific vehicle.

Note: Never drill holes or weld to Roll Over Protective Structures (ROPS).

Mount the Display bracket inside the cab using existing bolt threads if available. Some machines require drilling new holes and using different bolts. The Display bracket should position the Display at a convenient height for viewing the screen and for reaching the touch screen. The Display should never obstruct the driver’s view of the road ahead.

Note: The Universal Display Bracket provided in your kit can also be installed on a steel pipe within the cab using the hardware included in the installation kit. The Universal Display bracket fits most vehicles. However, some vehicles require the fabrication of custom brackets for Display installation.

Installation Examples

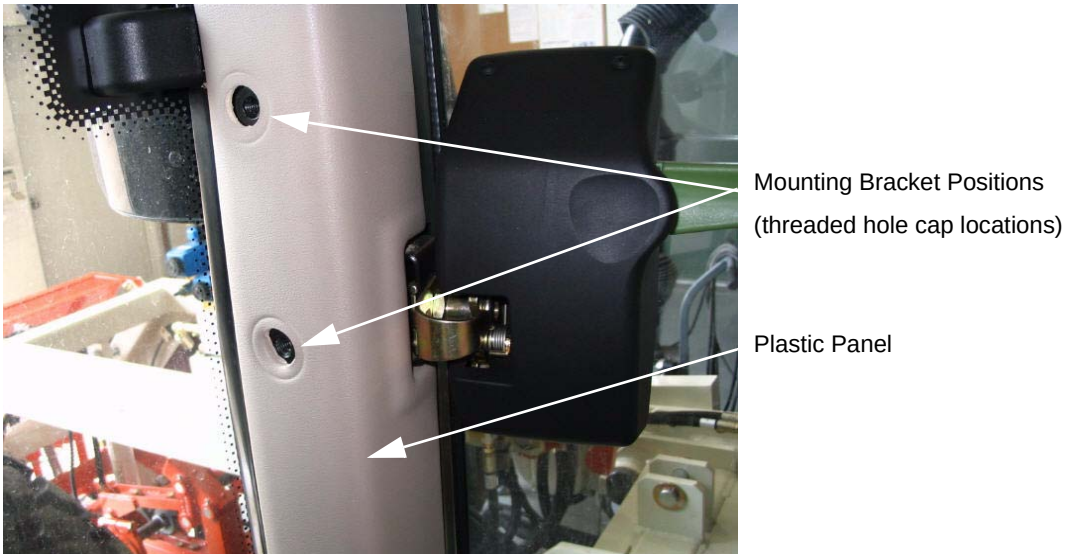
The following sub-sections provide examples of existing Display mountings:

- *Display Installation Example I*
- *Display Installation Example II*

Display Installation Example I

Unscrew the threaded plastic hole caps from the cab post. See *Figure 7-1*.

Figure 7-1 Remove Plastic Mounting Hole Covers



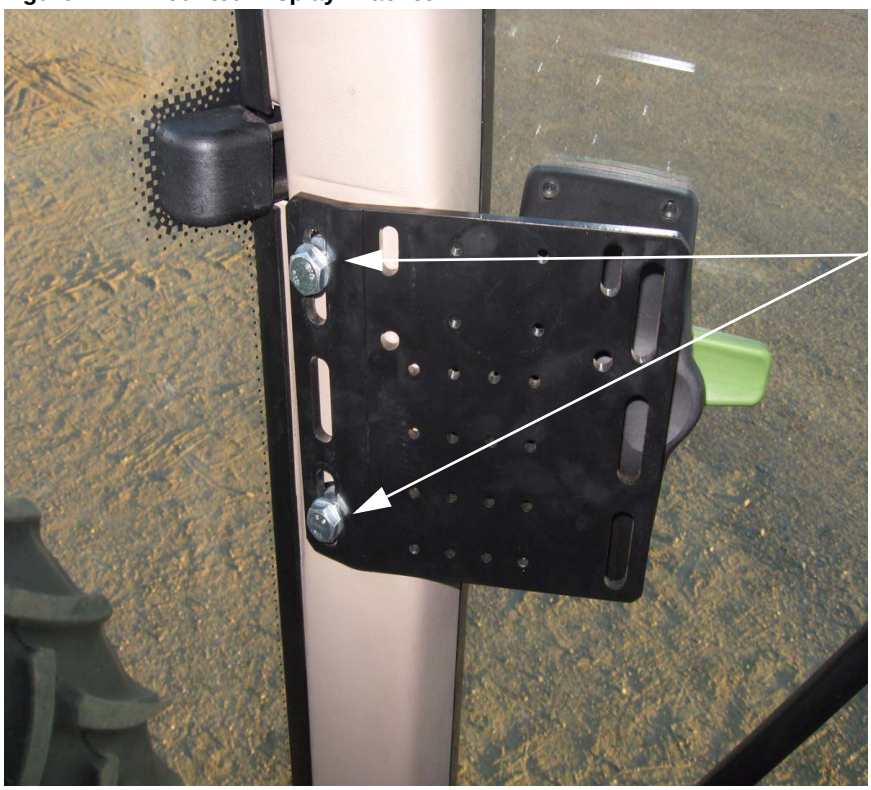
Choose the slots on your display bracket that provide a good mounting height.

Install the Display bracket on the right side of the cab using the two bolts provided.

Note: Three washers also need to be placed between the bracket and the cab post to enable space for the bracket to angle back towards the window. See *Figure 7-2*.

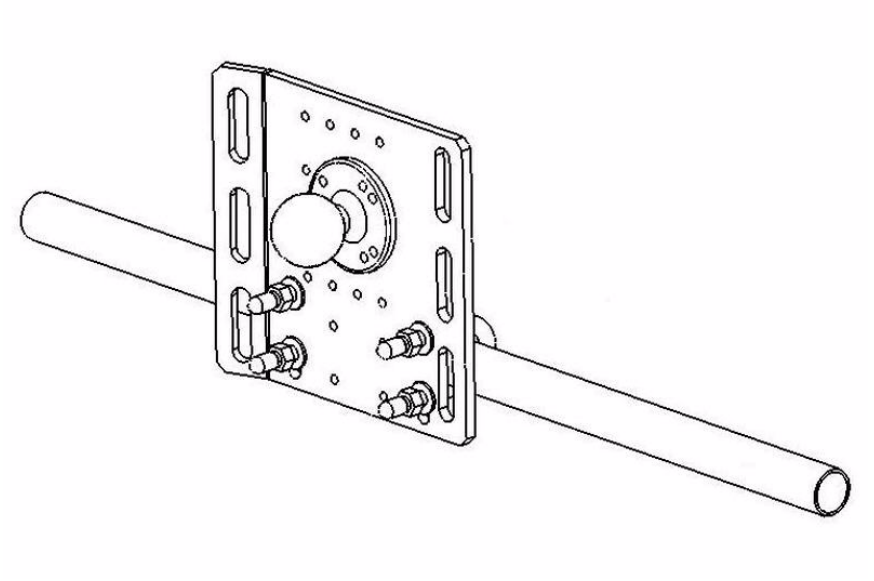
Tighten the bolts with a 17mm socket and ratchet.

Figure 7-2 Mounted Display Bracket



Note: The Universal Display mounting bracket can also be installed on steel pipes inside the cab See *Figure 7-3*.

Figure 7-3 Universal Display Bracket Mounted on Steel Pipe



Install the RAM Mount base ball (1-1/2” diameter) on the bracket, and secure the RAM base using four 10-32x3/4 Phillips screws and locknuts.

Tighten the bolts with a #2 Phillips screwdriver and a 3/8" wrench. See *Figure 7-4*.

Note: Refer to the Display User Manual for the remaining display specific installation instructions.

Figure 7-4 RAM Ball Mounted

Display Installation Example II

Locate the holes on the right side cab post. See *Figure 7-5*.

Figure 7-5 Mounting Holes on Cab Post

Mount the custom bracket to the cab frame.

Tighten the two bracket bolts using a socket and ratchet. See *Figure 7-6*.

Figure 7-6 Display Mounting Bracket Installed

Mount smaller bracket to the main bracket.

Tighten the bolts using a 14mm socket and ratchet. See *Figure 7-7*.

Figure 7-7 Attaching Smaller Bracket to Main Bracket

Attach the RAM mount to the Display mounting bracket. See *Figure 7-8*.

Figure 7-8 Attaching RAM Mount to the Display Bracket

Note: Refer to the Display User Manual for the remaining display specific installation instructions.

Connecting System Cables

This **Connecting System Cables** chapter provides information for connecting the Main Cable Harness and the SA Module Harness to various vehicle and AutoSteer components in the following sections:

- *SA Module Harness*
  - *SA Module Connection*
  - *Optional AutoSteer Wheel Angle Sensor*
- *Main Cable Harness*
  - *Roof Module*
  - *Display*
  - *Power Supply Connection*
    - *Cab Power Connection*
    - *Battery Power Connection*
- *Install Warning Label*

SA Module Harness

This **SA Module Harness** section contains the following sub-sections:

- *SA Module Connection*
- *Optional AutoSteer Wheel Angle Sensor*

Generally, the SA Module is mounted outside of the vehicle cab. The SA Module Harness cable connections to the AutoSteer Valve and Wheel Angle Sensor are routed around the cab, under the cab or through the vehicle chassis. The exceptions to this general rule are the SA Module power and data connections which connect to the Main Cable Harness.

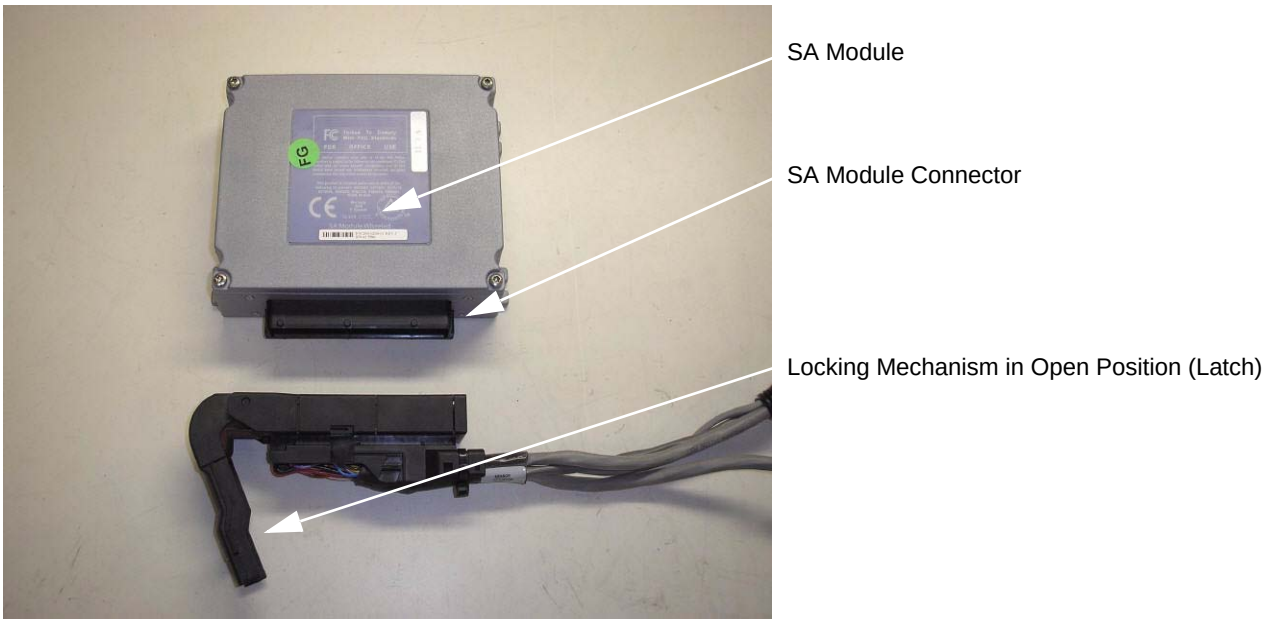
These connections can be routed through a bulkhead panel, a window rubber feedthrough or an available floor opening. Based upon the SA Module installation location selected, you must determine the most protected and shortest path for the SA Module Harness cables.

SA Module Connection

Align the SA Module Harness connector to the SA Module. See *Figure 8-1*.

Open the connector latch lever. See *Figure 8-1*.

Figure 8-1 Connecting SA Module Connector



Press the SA Module Harness connector onto the SA Module connector.

Note: You can damage the connectors if your force them into position. Do not force them together or use tools.

Press the latch lever closed until it clicks and locks the connector. See *Figure 8-2*.

Figure 8-2 Closing the SA Module Connector

Note: If you need to disconnect the SA Module connector, you must open the latch lever before attempting to pull the connectors apart.

Close the cable connector locking mechanism as shown in *Figure 8-3*.

Figure 8-3 SA Module Connector (closed).

Proceed to the *Optional AutoSteer Wheel Angle Sensor* procedure.

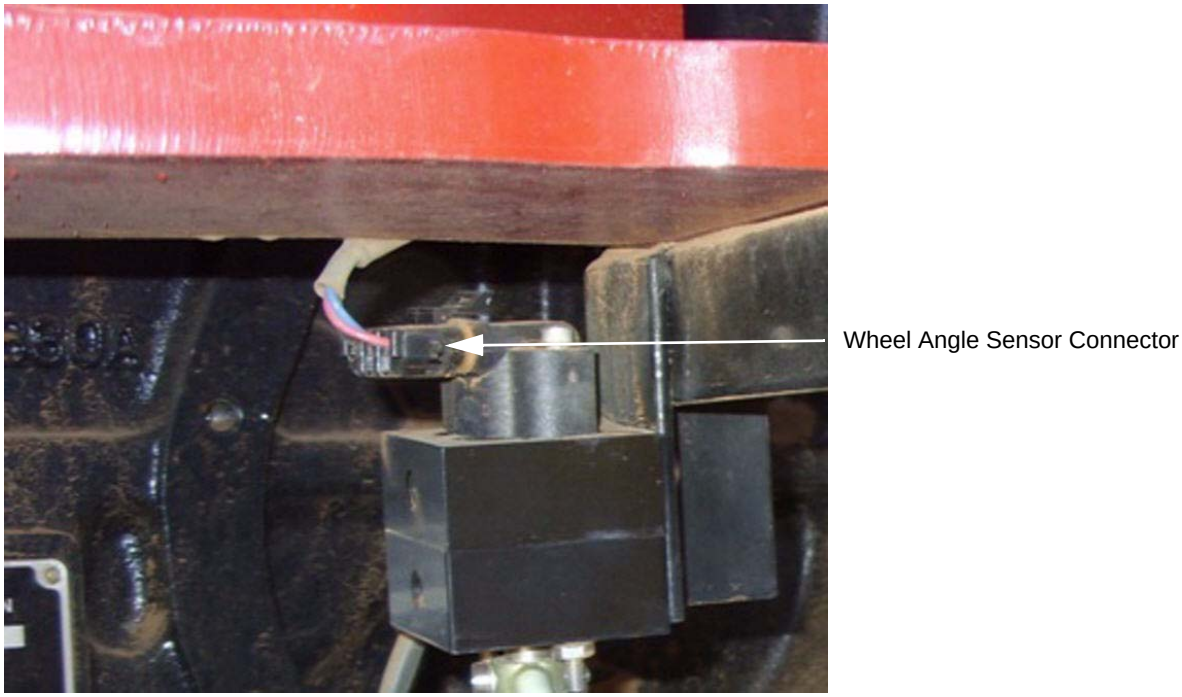
Optional AutoSteer Wheel Angle Sensor

This sections shows one example of connecting the Wheel Angle Sensor connector to the Wheel Angle Sensor.

Route the Wheel Angle Sensor cable and connector to the Wheel Angle Sensor using the most protected and shortest path.

Attach the Wheel Angle Sensor cable connector to the Wheel Angle Sensor. See *Figure 8-4*.

Figure 8-4 Wheel Angle Sensor Cable Connection



Secure all cables with cable ties.

Main Cable Harness

This **Main Cable Harness** section contains the following sub-sections:

- *Roof Module*
- *Display*
- *Power Supply Connection*

Generally, the Main Cable Harness has connections within the vehicle cab and must be routed through a bulkhead panel, a window rubber feedthrough or an available floor opening to access the SA Module and the Roof Module outside the cab. The location of cab component connections and the location of a cable feedthrough determine the specific routing path for the Main Cable Harness.

Note: On cabs not providing cabling entry points, it may be necessary to drill a feedthrough hole to enable cables to pass through the cab wall. Ensure you check both sides of the intended hole location before drilling to ensure there are not cables or other vehicle hardware which can be damaged. After verifying a safe and damage free hole location, drill a 1.5 inch or 1.75 inch diameter hole using a hole saw. Install a rubber grommet to protect cables passing through the hole.

Roof Module

After determining the best path for Roof Module cable routing, begin carefully pulling the cables through the feedthrough used and route the cables to the Roof Module. Ensure that a grommet is used to protect cables when they go through jagged metal edges on feedthrough holes.

Figure 8-5 through *Figure 8-7* show various cab feedthrough methods.

Figure 8-5 Passing Cable Through Floor Access Hole

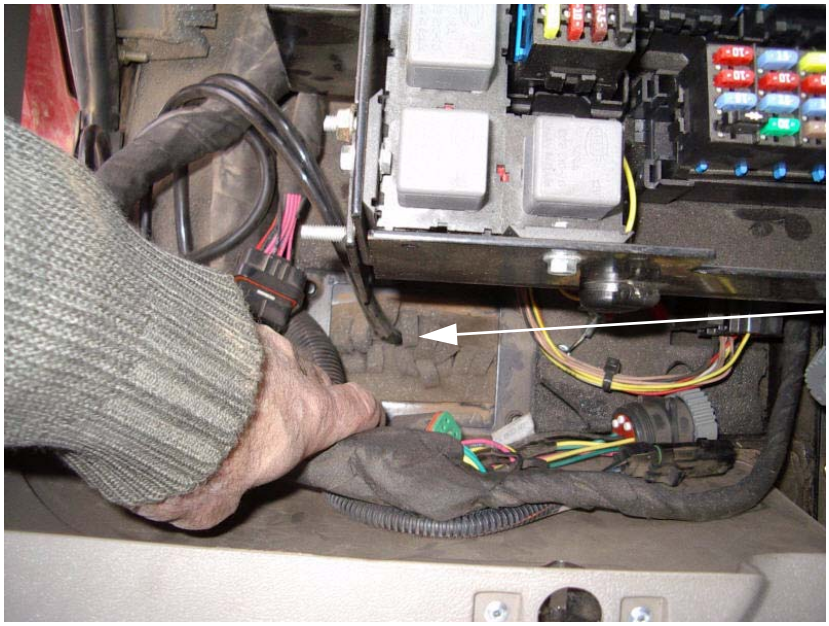


Figure 8-6 Main Cable Harness Exiting the Vehicle Cab

Figure 8-7 Cab Bulkhead Feedthrough

Route the cable up the cab side. See *Figure 8-8*.

Figure 8-8 Route Main Harness Up Cab Side

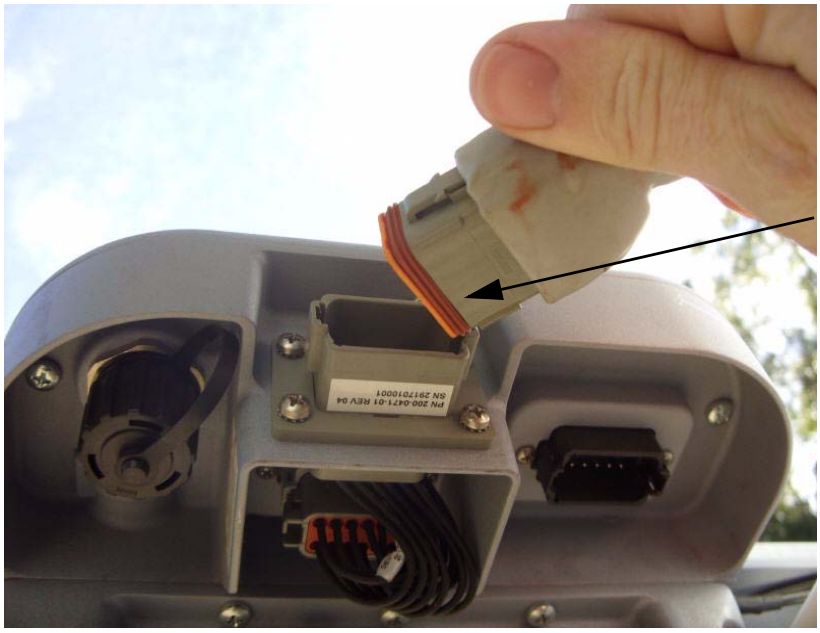
Secure the cable to the Roof Module bracket using cable ties.

Orient the 12-pin connector so the word TOP on the cable connector is pointing upwards (towards the sky). See *Figure 8-9*.

Insert the cable connector into the Roof Module. Push the connector in until it clicks and locks in place. To remove, grasp the connector to compress the two side latches and pull away from the Roof Module.

Note: Do not force the connector. If the connector does not engage easily, check the connector orientation.

Figure 8-9 Connecting the Main Harness to Roof Module



Orient the Ethernet cable connector with the connector under the receiver so the contacts on the cable connector are pointing towards the back of the vehicle. See *Figure 8-10*.

Note: This orientation is usually towards your right side if you are standing on the vehicle left side and looking towards the Roof Module.

Slide the cable connector into the receiver and rotate the plastic bayonet sleeve clockwise to lock the connector. See *Figure 8-10*.

Note: The bayonet sleeve will click when it fully engages and locks. To remove the cable, rotate the bayonet sleeve counterclockwise until it clicks and pull the connector down or away from the Roof Module.

Note: Do not force the connector. If the connector does not engage easily, check the correct orientation of the connector.

Figure 8-10 Roof Module Ethernet Connection

Display

1. Attach the Main Cable Harness to your Display harness.

Note: Refer to your Display Owners manual for details on connecting the Display harness.

Power Supply Connection

The following sub-sections describe basic instructions for connecting the AutoSteer system to available vehicle power sources:

- *Cab Power Connection*
- *Battery Power Connection*

Note: Refer to your display user manual before connecting the AutoSteer system to vehicle power.

The AutoSteer Main Cable Harness must be connected to a 3-pin 12V power source. Your Display User Manual provides specific instructions for connecting power to the AutoSteer system and specifies the appropriate vehicle power source.

Cab Power Connection

Locate a cab console 12V power outlet. See *Figure 8-11*.

Note: The exact location and type of power outlet is determined by your vehicle model.

2. Use a similar 12V accessory power connector if the Display manual specifies connecting to power inside the cab.

Figure 8-11 Cab 12V Power Outlet Example

Battery Power Connection

Locate the vehicle battery. See *Figure 8-12*.

Note: The location of the battery is determined by your vehicle model.

Connect to the vehicle battery if the Display manual specifies a direct battery connection.

Figure 8-12 Vehicle Battery Example

Note: A battery cable is provided with the AutoSteer system when a direct battery connection is required.

Install Warning Label

Install one or more Warning labels on the cab window in a position that is easy to read and does not obstruct the driver's view of the road or surrounding obstacles. See *Figure 8-13*.

Note: Install the warning label with the language that best matches the operator's language. If necessary, install labels in multiple languages. Warning labels are provided in the following languages: English, French, German and Spanish.

Figure 8-13 Autosteer Warning Label

Post-Installation Procedures and Information

This **Post-Installation Procedures and Information** chapter contains information on procedures and processes that should be completed after the installation process is complete. The information for this chapter is contained in the following sections:

- *Verify the Vehicle is Ready for AutoSteer*
- *Calibration and Tuning Notes*
  - *Starting the Calibration Procedure*

Verify the Vehicle is Ready for AutoSteer

1. Ensure all connectors are properly coupled.
2. Power ON the AutoSteer system.
3. Verify installation and system operation.

Calibration and Tuning Notes

Note: For optimal steering performance, the AutoSteer system must be fully calibrated and then tuned.

Select the appropriate vehicle model when setting up your vehicle on the AutoSteer system Display.

Starting the Calibration Procedure

Note: Always start your vehicle before powering ON the AutoSteer system.

Note: You need a GPS correction signal to perform the calibration procedure. The GPS correction signal can be provided by the base station, OmniStar or WAAS and the AutoSteer system must be in full working condition. (Roof Module plus the Display)

Troubleshooting

This **Troubleshooting** chapter contains some common system problems, possible causes and corrective actions.

- *Wheels do not turn in AutoSteer Mode*
- *Wheels do not Turn in Manual Steering*
- *Wheels turn in Opposite Direction in AutoSteer Mode*
- *Steering is Slow or Sluggish in AutoSteer Mode*
- *Wheels Only Turn in One Direction in AutoSteer Mode*
- *Pump Remains Stroked up Too Long or When not AutoSteering Pump Pressure is Always High*
- *Valve is Noisy or Chatter Occurs*
- *The Wheels Vibrate or Steering is too "Twitchy" in AutoSteer Mode*
- *AutoSteer Does not Kick-Out When Driver Turns the Steering Wheel*
- *AutoSteer Kicks-Out Without Turning the Steering Wheel*
- *Gear Pump That Supplies Oil for Steering System is Damaged*
- *Wheels are Wandering or do not Hold Position*
- *Wheels Keep Turning Only in One Direction Until they Hit the Stops*
- *The Hydraulic System is Always Noisy When the Engine is Running*

Wheels do not turn in AutoSteer Mode

- Valve harness not connected. Bad harness
- Wrong type of vehicle selected in AutoSteer setup. Wrong type of hose hookup to vehicle.
- LS Relief Valve pressure set too low. Check pump pressure.
- Wrong hose connections. Inverted pressure and tank hoses. Compare all hose connections to the correct hose diagram.
- Severe oil leakage on hose connections. Check all hose connections.
- Missing plug or orifice in position **13A** or **13C** (LS draining directly to tank).

Wheels do not Turn in Manual Steering

- Wrong hose connections
- Damaged pump. Check all hoses for correct connections.
- Severe oil leakage at pump or steering system. Turn off engine immediately and check all hose connections.

Wheels turn in Opposite Direction in AutoSteer Mode

- Right and Left Steer hoses are inverted. Bad valve cable. Steering direction inverted during system calibration.
- Pressure and Tank hoses are inverted. This requires immediate attention to avoid possible pump damage.

Steering is Slow or Sluggish in AutoSteer Mode

- Wrong load sense connections. Pump is not being stroked up.
- Bad Power Beyond connection.
- Missing plug or orifice in position **13C**.
- Bad LS shuttle valve. Check O-rings. Replace shuttle valve if necessary.
- Missing plug or orifice in position **13A**.

Wheels Only Turn in One Direction in AutoSteer Mode

- Bad SA Module Harness
- Bad valve harness (4-pin connector harness)
- Bad coil on one side of Proportional Valve
- Leaking LS shuttle valve in AutoSteer valve.
- Jammed spool on Proportional Valve. Could be caused by severe oil contamination.
- Bad pilot check valve cartridge. Leaking o-ring on one pilot check valve cartridge.

Pump Remains Stroked up Too Long or When not AutoSteering Pump Pressure is Always High

- Missing LS bleed-down orifice in position 1**3A** (only for Power Beyond installations)
- LS bleed orifice in position **13A** is dirty and blocked. (from oil contamination or following service). (only for Power Beyond installations)
- Wrong LS hose connections or wrong type of installation for the type of vehicle.

Valve is Noisy or Chatter Occurs

- Load Sense hoses are too long. Use shorter hoses. Install valve closer to hookup point to shorten hoses.
- Loose hoses. Secure hoses or use shorter hoses.
- Vehicle pump is generating pressure oscillations that create noise. Install hydraulic accumulator.
- Review complete hydraulic installation

The Wheels Vibrate or Steering is too “Twitchy” in AutoSteer Mode

- Wrong vehicle selected or wrong vehicle type selected. Confirm correct vehicle profile was selected.
- Wrong calibration. Repeat actuator calibration. Repeat Wheel Angle Sensor calibration.
- Wrong tuning gains or tuning not done. Steering gain too high. Repeat a complete tuning routine.
- Response rate slider set too high. Lower the response rate.
- Wrong parameters for 12V valve.
- Bad Wheel Angle Sensor or Wheel Angle Sensor bad cable.
- Valve flow is too high for the vehicle size. This can happen on very small vehicles.

AutoSteer Does not Kick-Out When Driver Turns the Steering Wheel

- Wrong transducer calibration. Follow correct calibration process. Lower the high pressure limit.
- Bad pressure transducer. Wrong type of pressure transducer (must be 3000psi with 4-20mA current output)
- Bad SA Module Harness.
- Wrong transducer selection in software.
- Wrong LS Orbitrol port hose connection.
- Ensure proper internal plug installation on Power Beyond installations.

AutoSteer Kicks-Out Without Turning the Steering Wheel

This can be considered normal if it only occurs immediately after a cold vehicle is powered up in very cold conditions when the oil is more viscous and the standby pump pressure and Return pressure are higher than normal.

- High pressure limit is set too low. Increase the transducer high pressure limit slightly.
- Bad pressure transducer or short in transducer harness.
- Valve response is too “twitchy” and is causing pressure spikes in the hydraulic system. Repeat the calibration and tuning.
- Vehicle electrical system is too noisy or has grounding problems.
- Defective transducer harness on the AutoSteer valve (missing resistor inside harness). Replace short transducer harness.
- If it kicks-out spontaneously only when acquiring the line, suspect pressure spikes or wrong transducer calibration.
- If AutoSteer kicks-out spontaneously in a random fashion while steering on the line, suspect electrical problems.

Gear Pump That Supplies Oil for Steering System is Damaged

- Inverted Pressure and Tank hose connections on the AutoSteer Valve. (inverted hoses eliminate the LS Relief Valve function)
- Inverted AutoSteer valve LS hose connections in combination with a plug installed by mistake in position **13B** on either conventional or dynamic Load Sense Orbitrol hookups. Plug must not be installed in position **13B** on closed center Orbitrol installations.
- Wrong hose connection.

Wheels are Wandering or do not Hold Position

- Bad pilot check valve on AutoSteer valve.
- Bad Wheel Angle Sensor.
- Bad calibrations for valve (actuator) or Wheel Angle Sensor.
- Low pump pressure. Pump is not being stroked up.
- Bad SA Module Harness or connectors.

Wheels Keep Turning Only in One Direction Until they Hit the Stops

- Bad Proportional Valve.
- Spool in the Proportional Valve is jammed due to dirt from oil contamination.

- Short on SA Module Harness.
- Defective SA Module.
- Broken SA Module Harness.
- Bad Wheel Angle Sensor.
- Bad calibration. Repeat Wheel Angle Sensor and actuator calibration.

The Hydraulic System is Always Noisy When the Engine is Running

- The pump may be stroked up to maximum pressure all the time. Check all hose connections and measure the standby pump pressure. (should be low)
- Oil level may be low.
- Defective pump or hydraulic system. Check vehicle hydraulic system.
- LS Bleed orifice is blocked or was not installed. (only for Power Beyond installations)

Final Hardware Installation Checklist

This **Final Checklist** chapter contains the verifications steps necessary after the installation of the AutoSteer system.

Note: The Final Hardware Installation Checklist is on the back of this page. You should keep a copy of this checklist and this manual for future reference when servicing the vehicle.

Vehicle Model: _____ Year: _____ Serial #: _____

Customer Name: _____

Location/Address: _____

AutoSteer Installation Kit Part Number: _____

NOTES

_____

_____

_____

_____

_____

_____

Name of Installer: _____ Date: _____

System Installation Checklist

1. Wheel Angle Sensor Installed and all fasteners are tight. ☐
2. Monitor Bracket Installed and all fasteners are tight. ☐
3. Roof rail is installed and all fasteners are tight. ☐
4. SA Module is installed and all fasteners are tight. ☐
5. All cable ends are connected. ☐
6. All cables are secured with cable ties. ☐
7. Roof Module locking pin is installed. ☐

Hydraulic Installation Checklist

1. Valve bracket is installed and all fasteners are tight. ☐
2. Valve is installed and all fasteners are tight. ☐
3. All hose fittings are tight. ☐
4. Check for oil leaks on all hydraulic connections. ☐
5. All hoses are routed and secured with cable ties. ☐
6. Adjust the AutoSteer Relief Valve. ☐
7. Measure the standby pump pressure. ☐ Value_____
8. Measure the maximum pump pressure in AutoSteer mode. ☐ Value_____
9. Manual steering is normal after the AutoSteer installation. ☐

AutoSteer Performance Checklist

1. Complete AutoSteer system calibration. ☐
2. Complete AutoSteer system tuning. ☐
3. Check total Wheel Angle Sensor counts. ☐ Value_____
4. Line acquisition is satisfactory. ☐
5. On-line steering is satisfactory. ☐
6. Manual override (kick-out) is working. ☐
7. Steering speed from lock-to-lock is satisfactory. ☐ Value_____Sec.

Note: See the *Post-Installation Procedures and Information* chapter for additional information.